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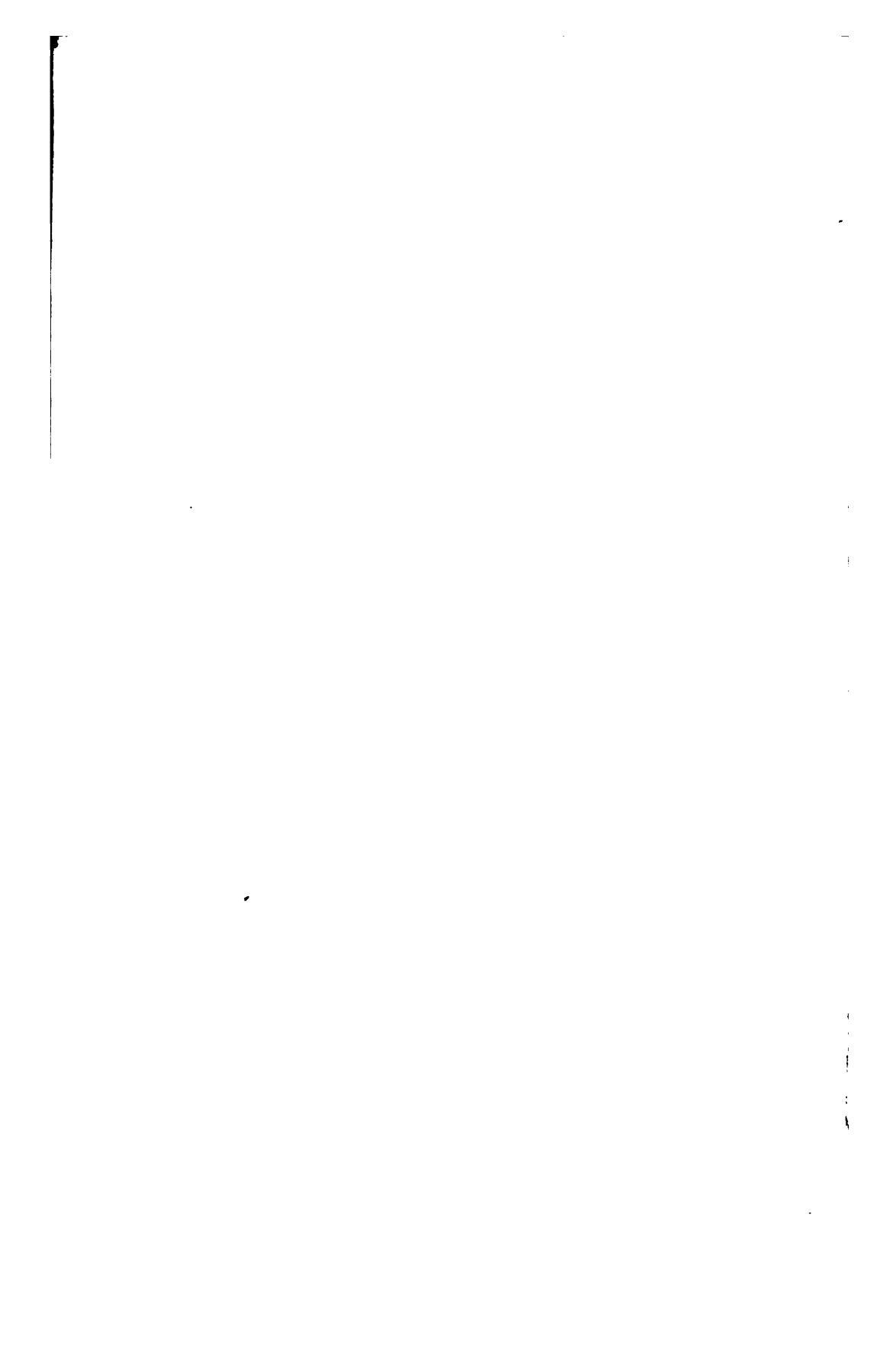
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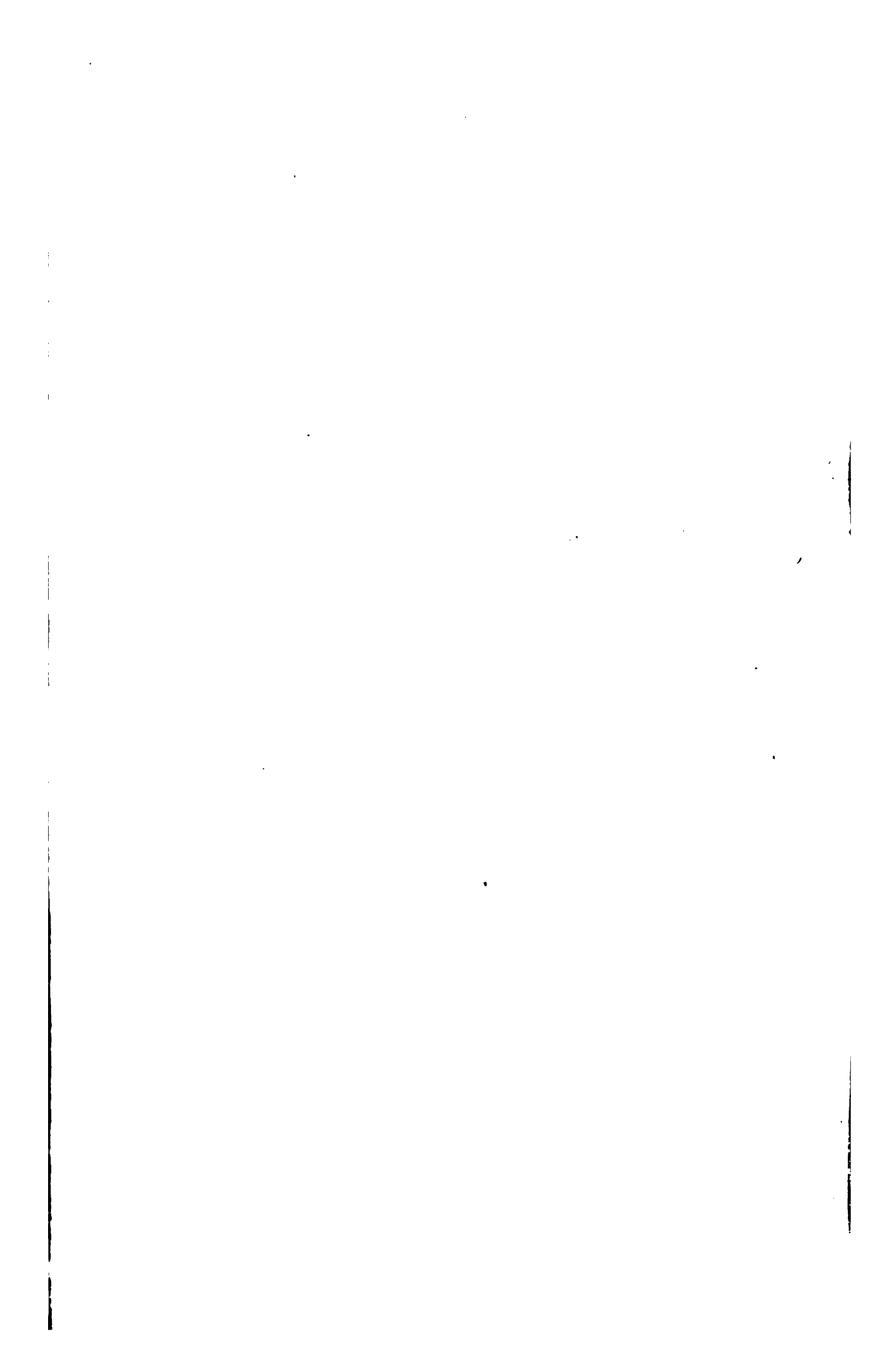
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H. O. No. 108A

GREAT LAKES PILOT

Volume I

LAKE ST. CLAIR, ST. CLAIR RIVER, LAKE HURON,
GEORGIAN BAY INCLUDING NORTH CHANNEL,
LAKE MICHIGAN, AND LAKE SUPERIOR

1921

SECOND EDITION

PUBLISHED AND SOLD BY THE HYDROGRAPHIC OFFICE
UNDER THE AUTHORITY OF THE
SECRETARY OF THE NAVY

PRICE, 90 CENTS



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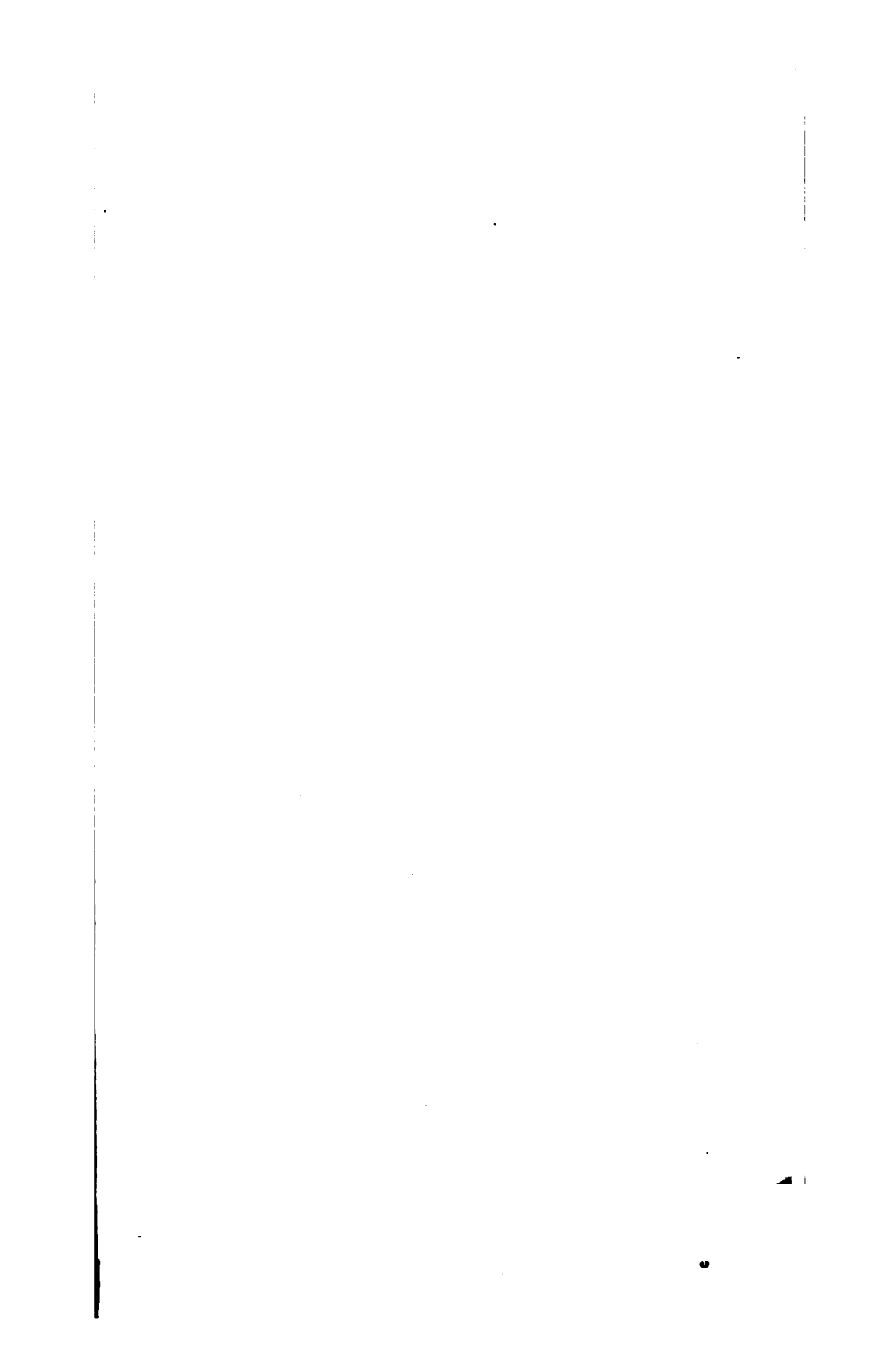
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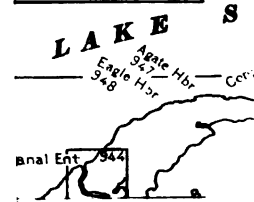
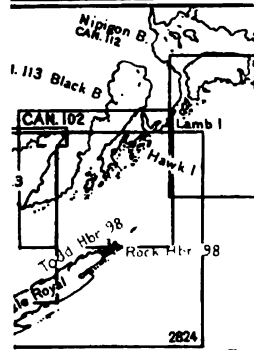
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PREFACE.

This, the first edition of the rearranged H. O. Publications No. 108-A, 108-B, and 108-C, contains descriptions of and sailing directions for the Detroit River above the city of Detroit, Lake St. Clair, St. Clair River, Lake Huron, Georgian Bay, North Channel, Lake Michigan, and Lake Superior.

The information embodied in this publication is mainly from Canadian Sailing Directions, for the Canadian shores of Lake Huron and Georgian Bay, H. O. Publications 108-A, 108-B, and 108-C, Bulletin No. 29, by United States Lake Survey Office, H. O. Charts, Lake Survey Charts, and Canadian Charts. It is corrected through Notices to Mariners No. 8, 1921.

The bearings and courses are given in degrees true, to the nearest degree, followed by the equivalent magnetic bearing, expressed in points to the nearest $\frac{1}{4}$ point, in parenthesis, thus with a variation of 5° west, course north true would read 0° (N $\frac{1}{4}$ E).

Bearings limiting the sectors of lights are toward the light.

The directions of winds refer to the points from which they blow; of currents, toward which they set. These directions are true.

Variations for the year, with the annual rate of change, may be obtained from Lake Survey Chart No. 0.

Distances are expressed in statute miles, the mile being approximately 1,760 yards.

Heights are referred to mean lake level.

For all details of lights and fog signals, the mariner should consult Light List, Great Lakes, United States and Canadian, issued by the Lighthouse Bureau of the Department of Commerce.

Depths.—The datum for the soundings mentioned herein are as follows:

The depths for the Detroit River are referred to the sloping surface of the river corresponding to a Lake St. Clair stage of 573.8 feet and a Lake Erie stage of 570.8 feet above mean sea level.

The depths for Lake St. Clair herein given are referred to low-water datum, the reference plane for United States river and harbor improvements, which for Lake St. Clair is 573.8 feet above mean sea level. Depths on the Lake Survey Charts referred to 575.11 feet above sea level are 1 to $1\frac{1}{4}$ feet more than those given herein.

The depths for the St. Clair River are referred to the sloping surface of the river corresponding to a Lake St. Clair stage of 573.8 feet and a Lake Huron stage of 579.6 feet above mean sea level.

The depths for Lake Huron herein given are referred to low-water datum, the reference plane for United States river and harbor improvements, which for Lake Huron is an elevation of 579.6 feet above mean sea level. Depths on the Lake Survey charts, referred to standard low water, are generally 1 foot less than those published herein.

The data of the soundings for Georgian Bay and North Channel are given at the beginning of each chapter.

The depths for Lake Michigan herein given are referred to low water datum, the reference plane for United States river and harbor improvements which for Lake Michigan is an elevation of 579.6 feet above mean sea level. Depths on the Lake Survey charts referred to standard low water are 1 foot less than those published herein.

The depths for Lake Superior herein given are referred to low water datum, the reference plane for United States river and harbor improvements, which for Lake Superior is an elevation of 601.6 feet above mean sea level. Depths on the Lake Survey charts referred to standard low water are 1 foot less than those published herein, but depths on the charts of Agate and Eagle harbors referred to an elevation of 602.82 feet above mean sea level are about 1 foot more.

Caution.—The mariner proceeding from Montreal to any port on the Great Lakes will use Canadian charts, Hydrographic Office charts, and Lake Survey charts. The distances, bearings, and the compass roses on these charts differ, so the mariner is cautioned to consult the notes on the chart in use to ascertain the scale and bearing.

Summary of Notices to Mariners.—While it is the intention of the Hydrographic Office to publish about the first of each year a Summary of Notices to Mariners, of the preceding year, affecting the volume, it must be understood that these summaries are intended to include only important changes and corrections, and that their publication may be discontinued at any time, especially when a new edition of the book is issued.

Masters of vessels should keep complete files of weekly Notices to Mariners and supply themselves with the latest List of Lights and seek from local authorities, pilots, and harbor masters the latest information relative to any special regulations in force in the particular locality visited.

Mariners are requested to notify the United States Hydrographic Office, Washington, D. C., or one of its branch offices, of errors they may discover in this publication, or of additional matter which they think should be inserted.

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INFORMATION RELATING TO NAVIGATION ON THE ST. LAWRENCE RIVER AND THE GREAT LAKES.

Publications.—The principal publications of the United States Hydrographic Office for the use of navigators are: Charts, Sailing Directions, American Practical Navigator, Altitude and Azimuth Tables, International Code of Signals, Light List, Notices to Mariners, Pilot Charts, and Hydrographic Bulletins. Of these the Notices to Mariners and the Hydrographic Bulletins are free to mariners and others interested in shipping. The Pilot Charts are free to contributors of professional information, but are sold to the general public at 10 cents a copy; other publications of the office are sold under the law at cost price, and can be purchased directly from the office or through its sales agencies, but are not sold by branch hydrographic offices.

Charts when issued are corrected to date.

The dates on which extensive corrections are made are noted on the chart on the right of the middle of the lower edge; those of the smaller corrections at the left lower corner.

The edition, and corresponding date, of the chart will be found in the right lower corner, outside the outer neat line.

Planes of reference.—The planes of reference for Lake St. Clair, St. Clair River, Lake Huron, Georgian Bay, North Channel, Straits of Mackinac, Lake Michigan, St. Mary River, and Lake Superior are given in the preface.

Accuracy of chart.—The character and accuracy of the survey on which any chart is based determine the value of the chart, and the larger the scale used the more is exactness necessary.

The source and date, which are generally given in the title, are good guides in judging a survey. Besides the changes that may have taken place since the date of the survey in waters especially where there is sand or mud, the earlier surveys were incomplete and inaccurate as to needed detail; therefore, a chart founded on such a survey should be used with caution until thoroughly tested. Except in well-frequented harbors and their approaches, most surveys made have not been so complete and thorough as to insure that all dangers have been found. The number of soundings on a chart also helps to estimate the completeness of the survey, but for the sake of clearness the chart is not expected to show all the soundings that were obtained.

Sparse or unevenly distributed soundings usually show that the survey was not made in much detail.

Large or irregular blank spaces among soundings mean that no soundings were obtained in these spots. It may be assumed when the nearby or surrounding soundings are deep, that in the blanks the water is also deep, but shallow soundings, or where reefs or banks are shown, such blanks should be cautiously used and be regarded with suspicion. Near coral regions and off rocky coasts, and also in waters where rocks abound, it is always possible that even a complete and detailed survey may fail to find every patch or pinnacle rock.

Fathom curves a caution.—The 5-fathom curve on most charts may be considered as a danger or caution line against approaching the shore or bank within that curve on account of the unknown inequalities of the bottom, which only an elaborate and detailed survey could reveal, such as a survey of a harbor. The necessities of navigation do not require such costly or so detailed a survey for the general coasts or little frequented anchorages. Vessels should not approach the shores in such localities without using special precautions. On rocky shores, the 10-fathom curve is another warning, especially for vessels of heavy draft.

A useful danger curve will be obtained by tracing with a colored pencil or ink the line of depth next greater than the draft of the vessel using the chart. The edge of the sanding serves as a well marked danger line for all vessels drawing less than 18 feet of water.

Where soundings are scarce and the bottom uneven, so that curves can not be drawn on a chart with accuracy, or at all, such charts should be used with caution.

Where an isolated sounding shows less water than surrounding depths, especially when marked with a dotted ring, it should always be avoided, as it is doubtful how thoroughly the spot was examined, and whether the least depth was found.

The chart on largest scale should always be used on account of its greater detail and the greater accuracy with which positions may be plotted on it.

Caution in using small-scale charts.—Consideration must be given to the scale of the chart used, when approaching land or dangerous banks. In plotting a position, a small error may mean only yards on a large scale, but on a small-scale chart the same amount of displacement may mean a large fraction of a mile.

Mercator chart.—Observed bearings are not identical with those shown on a Mercator chart (excepting the bearings north or south, and on the Equator east or west) because the line of sight, except as affected by refraction, is a straight line and lies in the plane of the great circle, while the straight line on the chart (except the

meridian line) represents, not the arc of a great circle, but the loxodromic curve, or rhumb line, which on the globe is a spiral approaching but never in theory reaching the pole; or if the direction be east and west, a circle of latitude.

The difference is not appreciable with near objects, and in ordinary navigation may be neglected. But in high latitudes, when the objects are very distant and especially when lying near east or west, the bearings must be corrected for the convergence of the meridians in order to be accurately placed on the Mercator chart, which represents the meridians as parallel.

Polyconic chart.—On the polyconic chart, since a straight line represents (within the limits of 15 or 20 degrees of longitude) nearly the arc of a great circle or the shortest distance between two points, bearings on the chart are identical with the observed bearings. All Lake Survey charts are polyconic projections.

The mercator projection is unsuited for surveying purposes; the polyconic projection is used by the Hydrographic Office and the Coast and Geodetic Survey in original surveys of coasts and harbors.

Notes on charts.—All notes should be read with care, as they may give important information that can not be graphically represented. The most usual or the mean direction of a current is shown on the chart by current arrows, but of course the direction may vary from that indicated by the arrow.

The velocities, also, of currents vary with the circumstances; and those given on the charts are the mean of, perhaps, just a very few observations.

Sources of supply of charts.—The St. Lawrence River to Cornwall and the Canadian shores of the Great Lakes are covered by Canadian and an occasional United States Hydrographic Office charts. The St. Lawrence River above Cornwall and the American shores of the Great Lakes are covered by United States Lake Survey charts.

Compass roses on charts.—The change in the variation from year to year must be taken into consideration when laying down on the chart courses and bearings from the magnetic compass roses, which become in time somewhat in error, especially in localities having a large annual rate of change; and in some cases, such as with small-scale charts or where long lines are used, the neglect of this change may cause displacement of position. The date of variation and the annual change, as given on the compass rose, facilitate corrections when the change has been considerable. The magnetic bearings and courses can readily be reduced to the true, then the true compass rose used. In certain parts of the world, the variation changes so rapidly for a change of position that a frequent change of course is required. The variation runs from

about 8° E. at the western end of Lake Superior to about 10° W. at the eastern end of Lake Ontario, and as the lines of equal variation run at right angles to the general course of the Lakes, the change of variation is large for a change of longitude. The total change as shown is 18°.

Aids—Buoys.—Buoys do not always maintain their exact positions; therefore, they should always be regarded as warnings and not as fixed navigational marks, especially during the winter months or when moored in exposed waters. A vessel's position should always, when possible, be checked, not by buoys, but by bearings or by angles of fixed objects on shore.

Light buoys can not always be relied on because the light may become extinguished, or if periodic, the apparatus may fail to operate.

Whistle and bell buoys are sounded by the action of the sea; therefore in calm weather, they are less effective or may not sound.

Nearly all buoys maintained on the Great Lakes are removed just before the close of navigation, and replaced just before the opening of navigation for the following season. Due notice of removal and replacement is given by the United States Lighthouse Service, United States Hydrographic Office, and the Canadian Hydrographic Office.

Lights.—Charts and light lists give for the visibility of lights, the distance for a height of 15 feet for the observer's eye, but the effect of a greater or less height of eye can be found by means of the table of distances published in all of the light lists.

Powerful lights often loom far beyond the limit of visibility of the actual rays of the light, and this must not be confounded with the range. Refraction often causes a light to be seen farther than under normal conditions.

Aloft the range of vision is much increased, and a light may be more readily picked up there. A nearly correct bearing of it may be obtained after laying down from aloft, by noting while aloft, a star immediately over the light whose bearing may be observed from the standard compass.

On first making a light from the bridge, by at once lowering the eye several feet and noting whether the light is made to dip it may be determined whether the vessel is on the circle of visibility corresponding with the usual height of the eye, or unexpectedly nearer the light.

When expecting to make a light in thick weather the real power of it should always be considered. Haze will obscure a weak light or a colored one, and no reliance can be placed on its being seen.

When a light is sighted it should be identified at once by checking its characteristics. This is particularly necessary when approaching

well-lighted coasts, where lights with similar characteristics are sometimes found close together.

The power of a light can be estimated by its candlepower or order, as given in the light lists, and in some cases by noting how much its visibility falls short of the range corresponding to its height. For example, a light elevated 120 feet above high water and described in the light list as visible only 9 miles in clear weather, would be of small intensity, as its height shows that it would be visible over 16 miles if of sufficient candlepower.

Lighting and extinguishing lights.—All United States and Canadian lights are maintained while navigation in their vicinity is open. Some of the lights are maintained throughout the year. All light buoys and lightvessels are placed on their stations as early as practicable in the spring and are replaced by unlighted buoys in the fall when endangered by ice conditions. Due notice of changes in aids to navigation are given by the United States Lighthouse Service, United States Hydrographic Office, and the Canadian Hydrographic Office.

Sailing Directions or Pilots are books treating of certain sections or divisions of the navigable waters of the globe. They contain descriptions of coast lines, dangers, and harbors, information of winds, currents and tides, and directions for approaching and entering harbors, and much other general information of interest to mariners, not found on the charts.

The Sailing Directions are corrected, as far as practicable, to the date of issue from the office; they can not, from their nature and the infrequency of their revision, be so fully corrected as charts and Light Lists, and for that reason, when they differ the one of the most recent issue should be accepted as the better authority.

Light Lists, published about once a year, are corrected before issue, and changes affecting them are published in the weekly Notices to Mariners.

The navigator should make notations of corrections in the tabular form in the Light Lists and paste in the appropriate places the slips from the Notices to Mariners.

Notices to Mariners, containing newly acquired information pertaining to various parts of the world, are published weekly and mailed to all United States vessels in commission, branch Hydrographic offices and agencies, and United States consulates. Copies are furnished free by the main office or by any of the branch offices on application.

With each Notice to naval vessels is also sent a separate sheet, giving the items relative to lights contained in the latest Notice, intended especially for use in correcting the Light Lists.

In addition to Hydrographic Office Notices to Mariners the Lake Survey issues monthly supplements to the Bulletin giving late information of the Great Lakes.

The United States Lighthouse Service and the Coast and Geodetic Survey issue a weekly Notice to Mariners, giving late information of interest to mariners on the Great Lakes.

Pilot Charts of the North Atlantic, Central American Waters, and North Pacific and Indian Oceans are published each month, and of the South Atlantic and South Pacific Oceans each quarter. These charts give the average conditions of wind and weather, barometer, percentage of fog and gales, routes for steam and sailing vessels, ice, derelicts, ocean currents, storm tracks, and other useful information. They are furnished free only in exchange for marine data or observations.

Hydrographic Bulletins, published weekly, are supplemental to the Pilot Charts, and contain the latest reports of obstructions and dangers along the coast and principal ocean routes and other information for mariners. They are to be had free upon application.

The bulletins are supplemented by the Daily Memorandum published daily, Sundays and holidays excepted, in order that the information relating to dangers and aids to navigation received may be disseminated as quickly as possible.

PILOTING—FIXING POSITION.

Piloting, in the sense given the word by modern and popular usage, is the art of conducting a vessel in channels and harbors and along coasts, where landmarks and aids to navigation are available for fixing the position, and where the depth of water and dangers to navigation are such as to require a constant watch to be kept upon the vessel's course and frequent changes to be made therein.

Piloting is the most important part of navigation and the part requiring the most experience and best judgment. An error in position on the high seas may be rectified by later observations, but an error in position while piloting often results in disaster. Therefore the navigator should make every effort to be proficient in this important branch, bearing in mind that a modern vessel is usually safe on the high seas and in danger when approaching the land and making the harbor.

The navigator, in making his plan for entering a strange port, should give very careful previous study to the chart and sailing directions, and should select what appear to be the most suitable marks for use, also providing himself with substitutes to use in case those selected as most suitable should prove unreliable in not being recognized with absolute certainty. Channel buoys seen from a distance

are difficult to identify, because their color is sometimes not easily distinguished and they may appear equally distant from the observer even though they be at widely varying distances. Ranges should be noted, if possible, and the lines drawn, both for leading through the best water in channels, and also for guarding against particular dangers; for the latter purpose safety bearings should in all cases be laid down where no suitable ranges appear to offer. The courses to be steered in entering should also be laid down and distances marked thereon. If intending to use the sextant and danger angle in passing dangers, and especially in passing between dangers, the danger circles should be plotted and regular courses planned rather than to run haphazard by the indications of the angle alone, with the possible trouble from bad steering at critical points.

The vessel's position should not be allowed to be in doubt at any time, even in entering ports considered safe and easy of access, and should be constantly checked, continuing to use for this purpose those marks concerning which there can be no doubt until others are unmistakably identified.

The vessel should ordinarily steer exact courses and follow an exact line, as planned from the chart, changing course at precise points, and, where the distances are considerable, the position on the line should be checked at frequent intervals. This is desirable even where it may seem unnecessary for safety, because if running by the eye alone and the vessel's exact position be immediately required, as in a sudden fog or squall, fixing at that particular moment may be attended with difficulty.

The habit of running exact courses with precise changes of course will be found most useful when it is desired to enter port or pass through inclosed waters during fog by means of the buoys; here safety demands that the buoys be made successively, to do which requires, if the fog be dense, very accurate courses and careful attention to the time, the speed of the vessel, and the set of the current; failure to make a buoy as expected leaves, as a rule, no safe alternative but to anchor at once, with perhaps a consequent serious loss of time.

In passing between dangers where there are no suitable ranges, as, for instance, between two islands or an island and the main shore when the conformations of the shore line are very similar, with dangers extending from both, a mid-channel course may be steered by the eye alone with great accuracy, as the eye is able to estimate very closely the direction midway between.

Changes of course should in general be made by exact amounts, naming the new course or the amount of the change desired, rather than by ordering the rudder to be put over and then steady when

on the desired heading, with the possibility of the attention being diverted and so of forgetting in the meantime, as may happen, that the vessel is still swinging. The steersman, knowing just what is desired and the amount of the change to be made, is thus enabled to act more intelligently and to avoid bad steering, which in narrow channels is a very positive source of danger.

Coast piloting involves the same principles and requires that the vessel's position be continuously determined or checked as the landmarks are passed. On well-surveyed coasts there is a great advantage in keeping near the land, thus holding on to the marks and the soundings and thereby knowing at all times the position, rather than keeping offshore and losing the marks, with the necessity of again making the land from a vague position, and perhaps the added inconvenience of fog or bad weather, involving a serious loss of time and fuel.

The route should be planned for normal conditions of weather, with suitable variations where necessary in case of fog or bad weather or making points at night, the courses and distances, in case of regular runs over the same route, being entered in a notebook for ready reference, as well as laid down on the chart. The danger circles for either the horizontal or the vertical danger angles should be plotted, wherever the method can be usefully employed, and the angles marked thereon; many a mile may thus be saved in rounding dangerous points with no sacrifice in safety. Ranges should also be marked in, where useful for position or for safety, and also to use in checking the deviation of the compass by comparing in crossing, the compass bearing of the range with its magnetic bearing, as given by the chart.

A continuous record of the progress of the vessel should be kept by the officer of the watch, the time and patent log reading of all changes of course and of all bearings, especially the two and four point bearings, with distance of object when abeam, being noted in a book kept in the pilot house for this special purpose. The vessel's reckoning is thus continuously cared for as a matter of routine and without the presence or particular order of the captain or navigating officer. The value of thus keeping the reckoning always fresh and exact will be especially appreciated in cases of sudden fog or when making points at night.

Where the coastwise trip must be made against a strong offshore or head wind, it may be desirable, with trustworthy charts, to skirt the shore as closely as possible in order to avoid the heavier seas and adverse current that prevail farther out. In some cases, with small vessels, a passage can be made only in this way. The important saving of coal and of time, which is even more precious, thus effected

by skillful coast piloting makes this subject one of prime importance to the navigator. However, many vessels have gotten into serious trouble by attempting to save time and cut down distances by rounding too closely dangers and aids, and navigators should always bear in mind that the safety of the vessels is the first consideration.

Fixing position.—A navigator in sight of objects whose positions are shown on the chart, and which he can recognize may locate his vessel by any one of the following methods:

1. Sextant angles between three known objects.
2. The bearing of a known object and angle between two known objects.
3. Cross bearings of two known objects.
4. Two bearings, of a known object, separated by an interval of time, with the run during that interval.
5. The bearing and distance of a known object.

Besides the foregoing there are two methods by which, without obtaining the precise position, the navigator may assure himself that he is clear of any particular danger.

1. The danger angle.
2. The danger bearing.

These various methods are fully explained in most textbooks on navigation and in Bowditch's American Practical Navigator, a copy of which should be in the navigator's outfit.

The first method of fixing the position, by the "three-point problem," is the most accurate of all methods, but requires the use of the sextant and protractor. However, the choice of the method should be governed by circumstances, depending upon which is best adapted to prevailing conditions.

DISTANCES AT WHICH OBJECTS MAY BE SEEN.

Table of distances at which objects can be seen according to their respective elevations and the elevation of the eye of the observer.

Heights in feet.	Distances in statute English miles.	Distances in geo- graphical or nautical miles.	Heights in feet.	Distances in statute English miles.	Distances in geo- graphical or nautical miles.	Heights in feet.	Distances in statute English miles.	Distances in geo- graphical or nautical miles.
5	2.958	2.565	70	11.067	9.598	250	20.916	18.14
10	4.184	3.628	75	11.456	9.935	300	22.912	19.87
15	5.123	4.443	80	11.832	10.26	350	24.748	21.46
20	5.916	5.130	85	12.196	10.57	400	26.457	22.94
25	6.614	5.736	90	12.549	10.88	450	28.062	24.30
30	7.245	6.283	95	12.893	11.18	500	29.580	25.65
35	7.826	6.787	100	13.228	11.47	550	31.024	26.90
40	8.366	7.255	110	13.874	12.03	600	32.403	28.10
45	8.874	7.696	120	14.490	12.56	650	33.726	29.25
50	9.354	8.112	130	15.083	13.08	700	35.000	30.28
55	9.811	8.509	140	15.652	13.57	800	37.416	32.45
60	10.246	8.886	150	16.201	14.22	900	39.836	34.54
65	10.665	9.249	200	18.708	16.22	1,000	41.833	36.28

16 TABLE FOR THE DETERMINATION OF THE DISTANCE FROM LAND.

EXAMPLE.—A light 150 feet above the water will be visible to an observer whose eye is elevated 15 feet above the water $18\frac{1}{2}$ nautical miles; thus, from the table—

15 feet elevation, distance visible, 4.443 nautical miles.
 150 feet elevation, distance visible, 14.05 nautical miles.

18.493

Table for the determination of the distance from land.—It is often difficult to estimate correctly the distance from land, as its appearance depends so much upon the condition of the atmosphere.

In the daytime, when well-defined objects are in sight, which are marked on the chart, cross bearings will at once determine the vessel's position. It may happen, however, that no objects for cross bearings can be seen, or, if seen, are not on the chart. At night and during thick weather the difficulty is still greater; and if only a single object, a light or a conspicuous headland, is visible, its distance, as estimated from its appearance, may be very erroneous, when, at such times, a knowledge of the correct distance is most desirable.

With two bearings of a single object and the course and distance made good by the vessel in the interval between them, the distance from it, when the second bearing is taken, may be found by means of the following table, which is also given in many works on navigation:

Table for finding the distance of an object by two bearings with the distance run between them.

Difference between the course and the first bearing—points.																			
Points.	3	2½	3	3½	4	4½	5	5½	6	6½	7	7½	8	8½	9	9½	10	10½	
4	1.00																		
4½	0.81	1.23																	
5	0.69	1.00	1.45	1.66															
5½	0.60	0.85	1.17	1.35	1.85														
6	0.54	0.74	1.00	1.14	1.27	1.39													
6½	0.49	0.67	0.88	1.00	1.11	1.22	2.17												
7	0.46	0.61	0.79	0.90	1.00	1.09	1.17	2.30											
7½	0.43	0.57	0.72	0.82	0.92	1.02	1.10	1.37	2.41										
8	0.41	0.53	0.67	0.76	0.85	0.93	1.03	1.30	1.86	2.50									
8½	0.40	0.51	0.63	0.72	0.80	0.88	1.00	1.25	1.66	2.03	2.56								
9	0.39	0.49	0.60	0.70	0.78	0.86	1.00	1.22	1.46	1.73	2.08	2.60							
9½	0.38	0.47	0.58	0.68	0.76	0.83	1.00	1.14	1.31	1.51	1.76	2.11	2.61						
10	0.38	0.48	0.57	0.66	0.74	0.81	0.94	1.06	1.19	1.35	1.55	1.79	2.12	2.60					
10½	0.39	0.47	0.56	0.65	0.72	0.81	0.90	1.00	1.11	1.24	1.39	1.57	1.80	2.11	2.56				
11	0.39	0.47	0.56	0.64	0.71	0.79	0.87	0.95	1.05	1.15	1.27	1.41	1.58	1.79	2.08	2.50			
11½	0.40	0.48	0.56	0.63	0.71	0.78	0.85	0.92	1.00	1.08	1.18	1.29	1.41	1.57	1.76	2.03	2.41		
12	0.41	0.49	0.57	0.64	0.71	0.78	0.85	0.92	1.00	1.08	1.18	1.29	1.41	1.57	1.76	2.03	2.41		
12½	0.43	0.51	0.58	0.65	0.71	0.77	0.83	0.90	0.97	1.03	1.11	1.20	1.29	1.41	1.55	1.72	1.96	2.30	

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Rule.—Multiply the distance run in the interval between the two bearings by the number found in the table under the difference between the course and first bearing, and opposite the difference between the course and the second bearing. The product is the distance at the time the second bearing was taken.

Example.—A lighthouse, when first seen, bore WNW.; after running W. by S. 16 miles it bore N. ½ W. Required, its distance when the second bearing was taken.

Difference between course and first bearing..... =3 points.
 Difference between course and second bearing..... =8½ points
 Corresponding tabular number..... =0.63
 And 16 miles \times 0.63=10.08 miles, the distance required.

With no landmarks in sight.—The only methods of determining the position of the vessel are by “dead reckoning” and by observations of heavenly bodies, though observations may be made use of by various methods. (See *American Practical Navigator* and textbooks on navigation.)

The one which should be best understood and put to the most constant use is that employing position or Sumner lines. These lines give the most comprehensive information to the navigator with the least expenditure of labor and time. The knowledge gained is that the vessel must be somewhere on the line, provided the data used is accurate and the chronometer correct. As the information given by one line of position is not sufficient to determine the definite location of the vessel, it is necessary to cross this line by another similarly obtained, and the vessel being somewhere on both must be near their intersection. However, a single line, at times, will furnish the mariner with invaluable information; for instance, if it is directed toward the coast, it marks the bearing of a definite point on the shore, or if parallel to the coast it clearly indicates the distance off, and so will often be found useful as a course. A sounding taken at the same time with the observation will in certain conditions prove of great value in giving an approximate position on the line.

The method of Marc St. Hilaire offers another way to readily determine a line of position, either by computation or by the use of various tables of altitude and azimuth.

An accurate position can be found by observing two or more stars at morning or evening twilight, at which time the horizon is well defined. The position lines thus obtained will, if the bearings of the stars differ 30 degrees or more, give an excellent fix. A star or planet at twilight and the sun afterwards or before may be combined; also two observations of the sun with sufficient interval to admit of a considerable change of bearing; in these cases one of the lines must be moved for the run of the vessel.

Fog signals.—Sound travels in a surprisingly changeable manner through the air. Apart from the influence of the wind large areas of silence have been found in different directions and at different distances from the origin of sound, even in clear weather; so do not depend too confidently upon hearing a fog signal. The fog sounding apparatus often requires some time before it can be operated. A fog sometimes creeps imperceptibly shoreward and may not be noticed by the lighthouse keepers until upon them; a vessel may have been for many hours in it, and approaching the land in confidence, depending on the signal, which is not sounded. Sound traveling against the wind may be thrown upward so that a man

aloft may hear it although it is inaudible on deck. Under other conditions it may be better heard on deck, so lookouts should be stationed at different levels.

The submarine bell system of fog signals is much more reliable than systems transmitting sound through the air, as sound traveling in water is not subject to the same disturbing influences; the fallibility of the lighthouse keeper is, however, about the same in all systems, so that caution should be observed even by vessels equipped with submarine bell receiving apparatus.

Submarine bells have an effective range of audibility greater than signals sounded in air, and a vessel equipped with receiving apparatus may determine the approximate bearing of the signal. These signals may be heard also on vessels not equipped with receiving apparatus by observers below the water line, but the bearing of the signal can not then be readily determined.

Vessels equipped with radio apparatus and submarine bell receivers may fix their distance from a light vessel having radio and submarine bell, utilizing the difference in velocity of sound waves of the radio and the bell. Sound travels 4,794 feet per second at 66° F. in water, and the travel of radio sound waves for practicable distances may be taken as instantaneous.

All vessels should observe the utmost caution in closing the land in fogs. The lead is very often the safest guide and should be faithfully used.

Radio compass stations.—Most valuable aids to navigation in a fog are the radio compass stations, which will fix a vessel's position by two or more bearings from a single radio station, or by simultaneous bearings from two or more stations.

In localities where only one radio compass station is available mariners may use the single bearing, like a Sumner's line of position, or a single bearing of any object whose position is known.

All reports from mariners indicate great accuracy in the bearings given by the radio compass stations where the distance is less than 50 or 60 miles offshore, and they should be used whenever available.

At the present time expert operators can send to vessels the true bearing from the sending station with an average error of 2°. In the future further improvements will doubtless increase this accuracy.

Stations on the Great Lakes.—The following radio compass stations are being erected by the Navy Department on the Great Lakes and will be operated by the United States Naval Communication Service:

1. White Fish Point, Mich.
2. Detour, Mich.

3. Grand Marais, Mich.
4. Eagle Harbor, Mich.
5. Manistique, Mich.

It is expected that these stations will be ready during the navigation season of 1921.

It is planned to erect stations at the following additional places:

6. Thunder Bay, Mich.
7. Devils Island, Mich.
8. Milwaukee, Wis.
9. Cleveland, Ohio.
10. Erie, Pa.

Due notice will be given when these stations are ready for traffic.

Soundings are of very great advantage when approaching land or shoal banks in determining the position, and the convenience in the use of modern sounding machines renders any neglect to take soundings inexcusable.

Soundings taken at random are of little value in fixing or checking a position and may at times be misleading. In thick weather when near or closing the land, soundings should be taken continuously and at regular intervals, and, with the character of the bottom systematically recorded. By laying the soundings on tracing paper according to the scale of the chart, along a line representing the track of the vessel, and then moving the paper over the chart, keeping the line representing the track parallel with the course until the observed soundings agree with those of the chart, the vessel's position in general will be quite well determined.

There are few places on the Great Lakes where soundings will not assist the mariner in a fog and they should be taken continuously in thick weather. The mariner should study the depths of water and character of the bottom in order to take advantage of any significant soundings or information of the bottom.

Use of oil for modifying the effect of breaking waves.—Experience has shown the usefulness of oil for this purpose, and that the methods of application are simple.

The following may serve for the guidance of seamen, whose attention is called to the fact that a very small quantity of oil, skillfully applied, may prevent much damage both to ships especially of the smaller classes, and to boats by modifying the action of breaking waves.

The principal facts concerning the use of oil are as follows:

1. On free waves, i. e., waves in deep water, the effect is greatest.
2. In a surf, or waves breaking on a bar, where a mass of water is in actual motion in shallow depths, the effect of the oil is uncertain, as nothing can prevent the larger waves from breaking under such circumstances; but even here it is of some service.

3. The heaviest and thickest oils are most effectual. Refined kerosene is of little use; crude petroleum is serviceable when no other oil is obtainable, or it may be mixed with other oils; all animal and vegetable oils, such as waste oil from the engines, have great effect.

4. In cold water, the oil, being thickened by the low temperature and not being able to spread freely, will have its effect much reduced. A rapid spreading oil should be used.

5. A small quantity of oil suffices, if applied in such a manner as to spread to windward.

6. It is useful in a ship or boat either when running, or lying-to, or in wearing.

7. When lowering and hoisting boats in a heavy sea the use of oil has been found greatly to facilitate the operation.

8. The best method of application appears to be to hang over the side, in such a manner as to be in the water, small canvas bags, partly filled with oakum, capable of holding from 1 to 2 gallons of oil, the bags being pricked with a sail needle to permit leakage. The waste pipes forward are also very useful for this purpose. Any method of using oil will answer that produces a slow and steady flow.

9. Crossing a bar with a flood current, to pour oil overboard and allow it to float in ahead of the boat, which would follow with a bag towing astern, would appear to be the best plan.

On a bar, with the ebb current running, it would seem to be useless to try oil for the purpose of entering.

10. For boarding a wreck, it is recommended to pour oil overboard to windward of her before going alongside. If she is aground the effect of oil will be depend upon attending circumstances.

11. For a vessel riding in bad weather to a sea anchor, it is recommended to fasten the bag to an endless line rove through a block on the sea anchor, by which means the oil can be diffused well ahead of the boat, and the bag readily hauled on board for refilling, if necessary.

The use of oil being of comparatively recent origin, much remains to be learned concerning the methods of application. Mariners are invited to forward the results of their experiences with the use of oil to the Hydrographic Office or any of its branch offices.



CHAPTER I.

GENERAL INFORMATION.

Plan.—H. O. Publication No. 108A, Great Lakes Pilot, Volume I, commences at Detroit, describes and gives sailing directions for Lake St. Clair, St. Clair River, Lake Huron, Georgian Bay, North Channel, Lake Michigan, and Lake Superior.

It connects at Detroit with H. O. Publication No. 108B, Great Lakes Pilot, Volume II, which describes and gives sailing directions for the remainder of the Great Lakes and the St. Lawrence River to Montreal.

Great Lakes.—While it is convenient to divide the Great Lakes Pilot into two volumes, to be properly understood the Great Lakes region must be considered as a single waterway. The Great Lakes are a series of inland seas whose aggregate area, about 94,100 square miles, exceeds that of any other series of fresh-water lakes in the world. They occupy depressions that are separated by low reliefs only from the drainage system of the Mississippi River and from the depression of Hudson Bay, the entire drainage area amounting to 288,245 square miles.

Their elevation ranges from about 600 feet in Lake Superior to 234 feet in Lake Ontario; but from Lake Superior to Lake Erie the fall is only 36 feet, so that almost the entire descent is accomplished in the Niagara and St. Lawrence Rivers. To overcome these falls various canals have been constructed which determine the dimensions of the lake carriers and give them their well-known characteristics.

Lake level.—In late years there has been a serious lowering of the lake level which has caused great concern, for the lessening of the draft available for a large lake carrier by 1 foot means a 10 per cent loss in cargo carried. For this reason there is considerable opposition to an enlargement of the Chicago Drainage Canal with a consequent increase in the amount of lake water carried off.

Climate.—The climate of this region is favorably affected by the Great Lakes, which moderate the cold in winter and the heat in summer. This permits the extensive fruit culture of this section, particularly in the Lake Erie region.

Fisheries on the Great Lakes attain considerable magnitude, which is apt to increase in the future; Georgian Bay supplies a large amount of fish to the markets of the United States.

Lake harbors are nearly all shallow, and are subject to constant silting, which requires regular dredging. They are usually protected by breakwaters, sometimes provided with stilling basins, with piers projecting from river banks to assist in scouring the harbor of silt. The water fronts are solidly built up with elevators, coal trestles, and warehouses, and provided with rails furnishing close connections between railway and water transportation.

Outlets to the ocean are (1) via the Erie Canal to Albany and New York Harbor; (2) via combined rail-and-water route to St. John, New Brunswick, Portland, Me., and Boston, Mass.; (3) via the St. Lawrence to Montreal. The Erie Canal as recently improved provides passage for 1,000-ton barges, which necessitates breaking cargo at Buffalo and again at an ocean port. The canals of St. Lawrence provide unbroken passage to small vessels. The delays incident to these routes have led many to advocate enlarging the St. Lawrence canals so that ocean-going steamers can dock at any of the ports of the Great Lakes.

Another plan proposed is an enlargement of the Chicago Drainage Canal to connect the Great Lakes with the ocean via the Mississippi. Either project would involve large expenditures, but the decreased cost of traffic would probably repay the initial cost very quickly.

Tributary canal systems include the Erie, the Ohio, and the the Chicago Drainage Canal, in the United States, and the Ottawa Canal, Rideau Canal, Trent Canal, Murray Canal, and Chambly Canal, in Canada.

These systems, connecting as they do the St. Lawrence, the Hudson, the Ohio, and the Mississippi, are bound to form a large part in any well-developed system of inland waterways.

Transportation.—Almost one-half of the gross tonnage of the United States merchant marine is employed on the Great Lakes, and a greater tonnage annually passes through the Detroit River than enters and clears in the foreign trade of the Atlantic and Pacific ports of the United States. The traffic of the canal at St. Marys Falls exceeds that of the Suez Canal.

Transportation on the Great Lakes excels that on the ocean in rapidity, economy, and efficiency. The richest part of the United States is tributary to the Great Lakes and offers for cargo the products of farm, forest, and mine. The bulkiness of the products and the short navigational season on the Great Lakes have made rapid cargo handling a necessity and this necessity has produced terminal facilities in all the large ports that include elevators, warehouses, wharves, belt-line railroads, tugs, barges—in short, all the modern appliances for the transshipment and storage of bulky cargo.

Commerce.—The bulk of the traffic is eastbound, consisting in the main of wheat, lumber, and ore from the upper lakes. The west-

bound traffic is principally coal and factory products from New York, Pennsylvania, Ohio, and West Virginia, and imports from Montreal. This has made the Lake Erie ports important exchange points for east-going and west-going products. The amount of United States wheat available for export is continually decreasing, the amount of Canadian wheat available for export is increasing and this will increase competition for east-bound cargoes of wheat and will influence the routes.

Ice.—Ice closes the Lakes to navigation for a certain period each year. The average season of open navigation is 225 days per year. Efforts are being made to extend the season by the use of ice breakers. Ferries used in connection with certain railroad systems are built to crush their way through the ice in an effort to maintain a year-round service.

Traffic on the Great Lakes resembles railroad traffic in density and schedule. Vessels are driven almost like locomotives in order to make the most of the open season. They are loaded and discharged in hours, and it is not unusual for one of the largest carriers to arrive at a port, load to capacity, and depart within six hours. As a result of this combination of terminal facilities and specially designed cargo carriers, the freight rates are low.

Lake carriers.—The dimensions of the vessels on the Lakes are fixed by the depths of the channels connecting the Lakes, particularly the passage between Lake Superior and Lake Huron and Lake Huron and Lake Erie. At present (1921) St. Marys Canal lock (Canadian), with a depth of 19 feet, a width of 60 feet, and an available length of 900 feet, controls traffic on Lake Superior, Lake Michigan, Lake Huron, North Channel, and Georgian Bay. The channels in St. Clair River and Lake control the entrance from the westward into the lower lakes. In 1921 the controlling depth was 20 feet, so that vessels designed to engage in through traffic between the upper and lower lakes could not exceed that depth.

The Welland Canal, passing vessels of 14 feet depth, 255 feet length, and 45 feet width, controls the dimensions of vessels designed to trade in Lake Ontario and further restricts their size. The various canals on the St. Lawrence have the same controlling dimensions as the Welland Canal, so vessels that can transit Welland Canal may become ocean carriers as well. The new Welland Canal is designed to carry vessels 800 feet long, 25 feet draft, and 80 feet wide. This enlargement will permit vessels of those dimensions to pass from Lake Erie to Lake Ontario, but the principal advantage resulting from the new Welland Canal will be passing vessels of 19 feet draft, and 860 feet length from Duluth or the head of the Lakes to Ogdensburg, N. Y., or Prescott, Canada, from which terminals it will be possible to lighter alongside ocean vessels at

Montreal. By employing standard 10,000-ton steamers from the head of the Lakes to Prescott, Canada, tugs and lighters thence to ship's side, elevator or warehouse at Montreal, cheap and rapid water transport is afforded. Naturally, this route will assist the Canadian trade more than the United States trade.

The United States trade already possesses a similar through eastern route from Duluth to Buffalo available for the largest lake carriers, and from Buffalo to the Hudson River and New York to ocean-going steamers via the Erie Canal.

Railroads.—The lake region in addition to being served by this water transportation is connected with the richest parts of the United States and Canada by the largest railroad systems of the United States and Canada. This land and water transportation made possible the rapid commercial development of the region and that development in turn called for additional transportation. Nowhere perhaps is the action and reaction between efficient land and water transportation and commercial development better shown than in this lake region.

The Lake Carriers' Association operates an information service for the benefit of members of the association. All information of a navigational nature is sent to the masters of vessels belonging to the association. If necessary or desirable, information is telegraphed.

This association maintains quarters for the officers and men of vessels belonging to the association in the larger ports of the Great Lakes.

Lake Survey Bulletin.—The Lake Survey Bulletin is published annually by the United States Lake Survey office at Detroit, Mich., to supplement the information given on the United States Lake Survey charts. Periodic supplements to the Bulletin are published from time to time to revise the information contained in the Bulletin.

The Bulletin supplies full descriptions of shore lines, outlying islands and shoals, harbors, bridges, storm-warning and Coast Guard stations, magnetic phenomena, rules and regulations, and the particulars of constantly changing conditions not adaptable to prompt or adequate representation on the Lake Survey charts. These publications are issued free to navigators and other chart purchasers.

Reporting defective or drifting aids.—Masters of vessels navigating in Lakes St. Clair, Huron, and Superior and connecting waters are requested, upon finding aids to navigation defective or adrift, to notify the tender *Amaranth* by radio, that prompt action may be taken to restore the aids to service.

The call letters of the *Amaranth* are NAPT.

Pilotage in United States waters.—All masters of vessels operating habitually on the Great Lakes are licensed pilots for those

waters. Consequently there are no regular pilot vessels carrying pilots stationed off the various ports. Strangers having occasion to navigate these waters should secure in advance of arrival the services of a licensed pilot.

It is reported that persons not qualified pilots but claiming to be such offer their services to strange vessels. So a stranger should exercise caution in obtaining a pilot.

Pilotage (Canada).—The governor in council may from time to time make the payment of pilotage compulsory or not compulsory within the limits of any pilotage district fixed by the governor in council. Local pilotage authorities are appointed by the governor general in council, with the exception of the districts of Montreal and Quebec, the minister of marine and fisheries being the pilotage authority for the two districts named. By-laws are framed and pilotage charges fixed by the pilotage authorities and approved by the governor in council. Pilots are licensed by the pilot authorities after they prove themselves competent by examination. Their boats fly the pilot's flag and pilots are required to offer their services to vessels whether they require them or not. The employment of pilots is not compulsory in any Canadian pilotage district, but the payment of pilotage dues in many districts is compulsory if the services of a pilot have been accepted or have been offered and refused, the charge in some districts being full pilotage rates and in others half rates, if spoken and the services refused. Where the by-laws provide, the payment of outward pilotage is compulsory as well as inward pilotage. Unlicensed persons when requested may act as pilots when a vessel is in distress or no pilot has offered to pilot a vessel or make a signal, and the unlicensed person shall be entitled to full pilotage dues for his services.

In waters where pilotage districts exist and it is impossible to board a vessel, a pilot is entitled to pilotage for leading a vessel by his boat to her destination. Masters of steamers running regularly in certain waters are sometimes licensed to pilot their own vessels upon payment of an annual fee.

British and Dominion Government vessels are exempt from the payment of pilotage dues and also any vessel bound inward when no licensed pilot offers his services; also—

Vessels making or entering a harbor of refuge.

Vessels registered in Canada of not more than 120 tons registered tonnage.

Any vessel whose master or mate is licensed to pilot his own vessel within the waters she is then navigating.

Vessels not exceeding 250 tons that any pilotage authority determines to be exempt within its jurisdiction.

All vessels registered in Canada of not more than 250 tons registered tonnage navigating the St. Lawrence River.

Further exemptions are vessels employed in trading between any one or more of the Provinces of Quebec, New Brunswick, Nova Scotia, or Prince Edward Island, and any other or others of them.

Vessels employed in voyages between any port or ports in the said Provinces or any of them and the port of New York or any port of the United States of America on the Atlantic north of New York.

Vessels employed in voyages between any port in any of the Provinces above mentioned and any port in Newfoundland.

Buoyage system.—The United States and Canadian Governments adopt, in the essential features, the same system of buoyage.

In proceeding up the St. Lawrence, or into harbors of either country, the buoys on the starboard hand are painted red and, when numbered, have even numbers. Those on the port hand are painted black, and marked with odd numbers.

Buoys marking middle grounds are painted with black and red horizontal bands and are passed on either hand. Those painted with black and white vertical stripes are placed in mid-channel, and must be passed close-to to avoid dangers.

All starboard hand spar buoys maintained by the Government of Canada have pointed tops and all port hand spar buoys have flat tops.

Perches, with balls, cages, etc., when placed on buoys, indicate turning points, the color and number indicating on which side they should be left.

Canadian buoys in the St. Lawrence River above Quebec are numbered on the charts under letters of the district, thus: Q, Quebec; C, Champlain; L, Lake, including Lake St. Peter; M, Montreal, etc. All but the plain spar buoys have their numbers and letters painted on them.

Different channels in the same bay, river, or harbor will be marked, as far as practicable, by different descriptions of buoys. Principal channels will be marked by nun buoys, secondary channels by can buoys, and minor channels by spar buoys. When there is but one channel, nun buoys, properly colored and numbered, are usually placed on the starboard side, and can buoys on the port side of it.

Day beacons, stakes, and spindles (except such as are on the sides of channels, which will be colored like buoys) are constructed and distinguished with special reference to each locality, and particularly in regard to the background upon which they are projected.

Numbering of light vessels.—The Canadian Government, for office convenience, paints numbers on all its light vessels.

Barometer readings.—The graduation of barometric scales in millibars having been introduced, the following scale will be useful for converting inches into millibars, and the reverse.



THE BAROMETER AND THE LAW OF STORMS.

The Great Lakes are the common passage ground of North American storms, the majority of which have their origin in Bering Sea, and make their way across the entire continent. The violent storms which pass up the Atlantic Coast of the United States exercise but little influence over the lake region.

While mariners upon the Great Lakes have their best safeguard in closely observing the storm warnings issued by the Weather Service of the United States and of the Dominion of Canada, there are many cases where a knowledge of the nature of the storms which visit the Lakes, and of the laws governing them, would prove of value. It requires but a brief period of systematic observations with the barometer and thermometer to enable the master of a vessel to keep himself fully informed at all times of the approach of any atmospheric disturbance likely to endanger the vessel.

The custom upon the Lakes of loading steamers until they can barely pass over the sills, and the unwieldy size of the tows carried by the towboats, put both classes of vessels at the mercy of the wind and waves. In the first case, when overtaken by a storm, the heavily laden steamer, too deep in the water for proper handling, has simply to depend for safety upon her staunchness; in the second, the only possible resource is to cut adrift the tow, if it has not already gone to pieces. Under such circumstances, any means of predicting a coming storm, of foretelling the shifts of the wind, and the probability of a certain shore furnishing a continuous lee for anchorage has a double value. Many lake vessels are equipped with aneroid barometers and thermometers, and it requires but a brief period of observation with these two instruments to enable the mariner to keep himself informed at all times of the approach of any extensive atmospheric disturbance likely to endanger his vessel. The United States Hydrographic Office is desirous of assisting lake navigators in this matter, and accordingly here presents a brief description of storms in general and the value of the barometer in predicting them.

In order to use the barometer intelligently, as a means of forecasting the weather for any region, it is necessary to have a knowl-

edge of the mean, or average, barometric pressure prevailing over the region. In consequence of their elevation above sea level, the normal barometric pressure over the Great Lakes is far below the pressure at the seacoast, actual barometric readings upon the upper lakes ranging between 28.30 inches and 30.20 inches. The elevation of each lake, the average barometric pressure over that lake, and the correction which must be added to that pressure in order to reduce it to sea level, which is the common plane of reference, is as follows:

Place.	Above sea level.	Mean barometric pressure.	Correction.
	<i>Fect.</i>	<i>Inches.</i>	<i>Inches.</i>
Lake Superior.....	602	29.30	+0.65
Lake Michigan.....	581	29.38	+0.62
Lake Huron.....	581	29.38	+0.62
Lake Erie.....	573	29.39	+0.61
Lake Ontario.....	247	29.73	+0.27

For this reason the words "fair," "change," "stormy," etc., upon the face of the aneroid barometer are worse than useless when the barometer happens to be used in the lake regions, or, indeed, at any point whose elevation differs much from sea level. The pressures given upon the United States Weather Bureau Map have all been reduced to sea level by the application of the proper correction, and other observations must be similarly reduced before any comparison is possible.

The figures of the table give the average reading of a standard barometer at the temperature of freezing, and placed at the level of the lake. Before comparing the reading of the vessel's barometer with them, the latter must be reduced to the same condition by the application of certain corrections, viz:

1. The initial correction.
2. The temperature correction (applied only when the barometer is mercurial).
3. The correction for height above sea level.

The initial correction is best obtained by directly comparing the barometer with some standard. The method adopted at seaports of comparing the 8 a. m. barometer readings of the vessel and Weather Bureau is inapplicable upon the Lakes, as it involves the reduction to sea level.

The temperature correction, which depends upon the reading of the attached thermometer, is required for mercurial barometers only, and may be taken from the following table:

Temperature.	Correc- tion.	Temperature.	Correc- tion.	Temperature.	Correc- tion.	Temperature.	Correc- tion.
	<i>Inch.</i>		<i>Inch.</i>		<i>Inch.</i>		<i>Inch.</i>
30.....	0.00	45.....	0.04	60.....	0.08	75.....	0.12
31.....	0.01	46.....	0.05	61.....	0.09	76.....	0.13
32.....	0.01	47.....	0.05	62.....	0.09	77.....	0.13
33.....	0.01	48.....	0.05	63.....	0.09	78.....	0.13
34.....	0.02	49.....	0.05	64.....	0.09	79.....	0.13
35.....	0.02	50.....	0.06	65.....	0.10	80.....	0.14
36.....	0.02	51.....	0.06	66.....	0.10	81.....	0.14
37.....	0.02	52.....	0.06	67.....	0.10	82.....	0.14
38.....	0.03	53.....	0.07	68.....	0.10	83.....	0.14
39.....	0.03	54.....	0.07	69.....	0.11	84.....	0.15
40.....	0.03	55.....	0.07	70.....	0.11	85.....	0.15
41.....	0.03	56.....	0.07	71.....	0.11	86.....	0.15
42.....	0.04	57.....	0.08	72.....	0.12	87.....	0.15
43.....	0.04	58.....	0.08	73.....	0.12	88.....	0.16
44.....	0.04	59.....	0.08	74.....	0.12	89.....	0.16

The correction for height above lake level amounts to 0.01 inch for each 10 feet that the barometer is above the level of the lake, and must be added to the barometer reading.

As an example of the application of these corrections, let the reading of a mercurial barometer, hanging 22 feet above the level of the lake, be 29.35 inches, the attached thermometer showing a temperature of 71°. Suppose that a previous comparison with a standard has shown that the barometer reads 0.13 inch too high. Then we have:

	<i>Inches.</i>
Barometer, as read.....	29.35
Correction for initial error.....	—0.13
Correction for temperature.....	—0.11
Correction for height above lake level.....	+0.02
True pressure	29.13

Had the barometer been an aneroid, no correction for temperature would have been required. Having applied these corrections to the barometer, as read, the corrected value may be compared with the average pressure, and predictions made as to the weather expected. Fine weather with a barometer below the average may occasionally occur, but only as a prelude to wind and rain.

A falling barometer, accompanied by a rising thermometer, increasing moisture, and southeasterly winds, will almost invariably be followed by foul weather, with northeasterly gales continuing for some time after the barometer has begun to rise. Rapid changes of the barometer foretell brief periods of weather indicated; slow changes, extended periods. The approach of a thunderstorm may be sometimes detected by a slow fall of the barometer, followed by a sudden rise of about 0.05 of an inch upon the arrival of a wind squall.

Changes of weather upon the lakes follow each other in rapid succession, and the barometer should be read at regular intervals, and the reading recorded, especially during the months of October and November, to guard against surprise.

The force of the wind is somewhat greater in the rear of a storm than in front, while its center, or region of lowest barometer, has a movement of its own, bearing with it the whole system of incurving winds, the result being precisely similar to the manner in which an eddy is carried onward by the current of a river. The velocity of this motion, which is greater for continental than oceanic storms, varies from month to month, being at its maximum in winter and minimum in summer.

Nature and cause of storms, and barometric changes attending them.—Upon the weather map published for each day by the United States Weather Bureau there will, in general, appear one or more approximately circular areas marked “low,” while others of rather more irregular outline will be marked “high,” the two alternating, one with the other. The first implies that the reading of the barometer within the area indicated is below the average, the second, that it is above it. If we examine a number of these charts from day to day in succession we will note that the position of the center of each of these areas upon any particular day is considerably to the eastward of that of the day previous; i. e., there is a rapid easterly motion of both lows and highs, continuing in the case of the former until they either fill up or disappear over the Atlantic. The presence of these “lows” exercises a very direct influence over the weather of the region throughout which they prevail. Ordinarily during the season of lake navigation they are felt merely as periods of warm rainy weather; in exceptional cases they deepen, i. e., the barometer falls far below the average, under which circumstances they are attended by the rough weather and heavy gales which constitute a storm.

As these lows approach from the westward, barometers in advance of them are gradually depressed below the mean, generally at a sufficient interval before the appearance of the worst features of the storm to allow the mariner to take proper measures for encountering it. It is upon the barometer, therefore, that he must mainly rely for notice of the storm's approach.

As long as the barometer continues to read within a few hundredths of the average pressure, no decided change in the weather may be anticipated. It is, however, when the pressure starts to rise or fall that the indications of the instrument become of value, as betokening approaching changes, a rise being apt to be followed by an improvement in the general weather conditions, a fall by the reverse. Should the fall continue and be accompanied by other symptoms, such as a southeasterly wind and an increase in temperature, it is safe to count upon a period of stormy weather.

Storms are due primarily to the formation and persistence of areas of low barometer. Under ordinary circumstances the read-

ing of the barometer differs but little from the mean. The atmospheric pressure over a certain region having fallen below the average, air rushes in from all sides to fill a vacant space in its midst. Under certain complicated conditions the influx of this new air, instead of filling up the area of low barometer, serves only to increase it, the depression becomes deeper, the influx of air becomes stronger, and a storm is established. As the storm gains in intensity, the area of low barometer assumes a roughly circular shape and attains a diameter varying from 200 to 500 miles, and even greater.

The storm center.—The point of lowest barometer is known as the storm center, inasmuch as it generally coincides very nearly with the center of the area over which the storm prevails. As we go outward from the center in any direction the atmospheric pressure increases and the barometer rises; and if we draw the isobars, or lines along which the barometric pressure is the same, say for 29.00, 29.10, 29.20, etc., inches, we will find that they form closed curves, nearly circular or elliptical in shape, one outside of the other, having for a common center the point of lowest barometer.

Neither during the course of their formation nor afterwards are these storms, or areas of low pressure, stationary. They move constantly from west to east or from southwest to northeast with a velocity ranging from 15 to 40 miles per hour. The storms which cross the Lakes during the season of navigation have their origin not on the Lakes themselves, but at a distance, some in the Southwestern States, Kansas, Indian Territory, and northern Texas, whence they move northeastward, the center reaching the lake region during the second or third day of its existence; the remainder originate to the northwestward, in the Canadian Provinces of Assiniboia and Alberta, and move eastward.

As such a storm approaches the Lakes, across the States of Missouri and Illinois if it belongs to the first class, across Minnesota and Wisconsin if to the second class, the barometer in advance of it begins to fall, and continues to fall as long as the storm center continues to approach. The center having passed and begun to recede to the eastward, the barometer begins to rise.

Average storm track.—The path followed by the storm center in moving eastward is known as the "storm track." By comparing the observations of many years, plotting the successive positions of the center of each storm as it approaches the Lakes, and drawing the tracks, it becomes apparent that for each class of storms there is a certain strip or belt along which the storm center seems to travel in preference to any other. This belt is known as the "average storm track," and is shown for the Great Lakes and the country to the west

on the small chart. (Fig. 1.) Occasionally a storm travels outside the general belt and takes an erratic course; but it is seldom that one takes a direction differing materially from the general progressive movement of the majority. It is very necessary, however, that the average path should not be blindly accepted as the real path of any particular storm.

Shape of the area at low pressure.—For the sake of simplicity, in what has preceded, the outline of the depression has been described as circular. In point of fact, however, this assumption is rarely fulfilled, the general shape of the isobars, especially those near the center, being oval, differing greatly in different storms, and, in fact, from day to day in the same storm, the whole area undergoing continuous change. The grouping around the common center is furthermore by no means symmetrical, the isobars being very much closer together in certain directions from the center than in others, which is

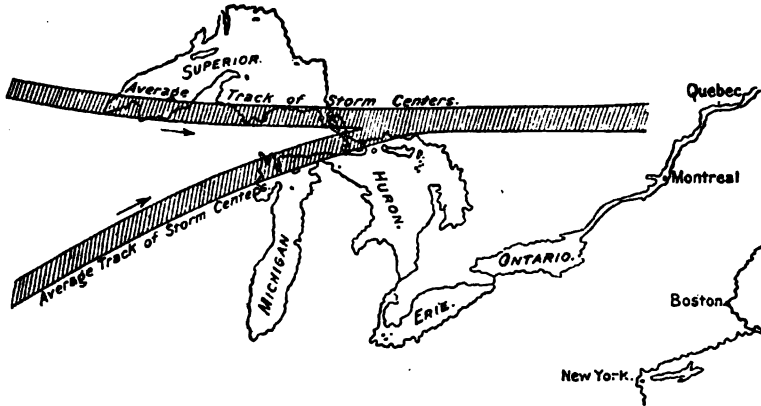


Figure 1.

equivalent to saying that the rise of the barometer as we go from the storm center in that direction is very much more rapid than in others; and just as water runs down a steep hill much more rapidly than it does down a gradual one, so the air runs down this steep barometric slope more rapidly than it does down the gradual, the common experience being that the winds are much stronger in that portion of the storm where the isobars are crowded together than where they are widely separated.

Barometric definition of a storm.—Barometrically considered a storm is an eastward-moving, oval-shaped, depression, several hundred miles in diameter, the depression being deepest (barometer reading lowest) near the center, and sloping upward from the center on all sides.

Wind and weather in the various parts of the depression.—Observation has shown that there are various conditions of wind,

cloud, temperature, etc., which are peculiar to certain portions of these depressions, the same conditions being always encountered in the same portion. Of no feature of the weather is this so true as of the direction of the winds around the center of the storm, and it is by carefully observing this direction and the manner in which it changes—the “shifts” of the wind—added to the behavior of his barometer, that the mariner is enabled to decide whether he is in advance of the storm, with the latter bearing down full upon him, or in the rear, having already withstood its worst severity; whether he is to the north of the track or to the south; and if compelled to heave to, whether he must do so on the port tack or on the starboard, in order to escape the danger of being overborne by the heavy seas, or struck aback by some sudden squall of wind.

Air is like water; and just as water always flows from a higher to a lower level, so air always flows from a region of high barometer to a region of low. Accordingly, as soon as a barometric depression is formed at any point, there is a tendency of the air to rush in from all sides toward that point, until the depression is filled up and the barometric level is restored. If, then, barometric difference were the only thing to be considered, we would find surrounding a storm a series of winds, of force proportioned to the steepness of the side of the depression, all blowing straight toward the center, just as the spokes of a wheel are all directed toward the hub. This simple condition of things is never realized, owing to the fact that, in the first place, the storm center itself is in rapid motion, and a wind constantly directed toward this center would therefore of necessity be continually shifting; and, in the second place, to the fact that all winds in the northern hemisphere, owing to the rotation of the earth on its axis, undergo a constant deflection toward the right. Under these two influences the wind, instead of blowing directly toward the storm center along straight lines, follows a constantly incurving path. In the northern hemisphere we have, therefore, the following law governing the “Rotation of the Winds”:

Around a center of low barometer the winds circulate in a direction contrary to the motion of the hands of a watch.

To the east, then, in advance of a barometric depression, southerly and southeasterly winds will thus prevail, marking the storm's approach. To the west, in the rear, northerly and northwesterly winds, marking its departure. North of the center we have easterly and northeasterly winds; south of the center, westerly and southwesterly.

This movement of the air around the center is well illustrated by the discharge of water from a washbowl through a central opening in the bottom, first sprinkling the surface of the water with a little powder in order to make its motion visible. The water soon takes

up a spiral movement and flows around in diminishing circles until the center is reached. Assuming the water current to be wind, it is seen that a ship involved in such an aerial flow at sea might have the wind at any quarter, according to her bearing and distance from the center.

Bearing of the storm center from the observer.—The diagram (fig. 2) represents this circulation of the winds around the storm center or low. For the sake of simplicity, the storm is made circular, the light dotted lines representing the isobars, the heavy full lines the direction of the winds. The latter is, in general, inclined two compass points to the left of the former. An observer on the deck of the vessel with his back to the wind will therefore find

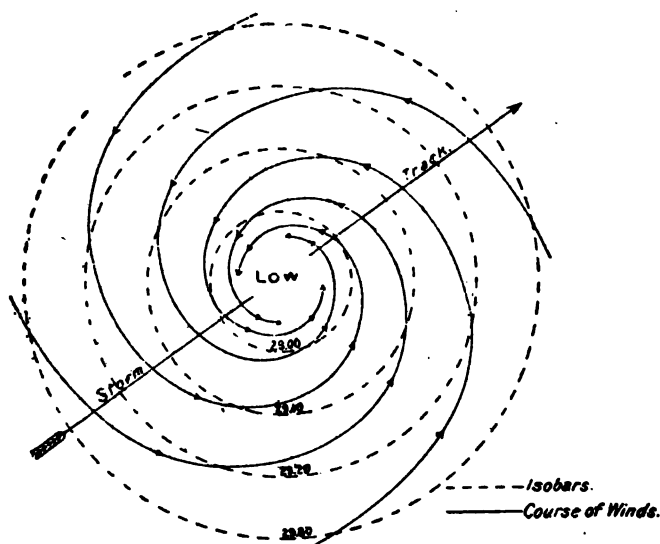


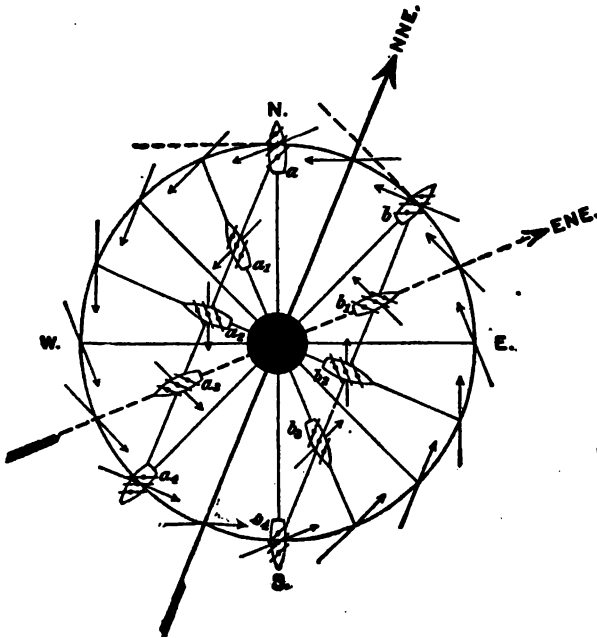
Figure 2

the storm center, or point of lowest barometer, six points to his left; or, if he faces the wind, the center will be 10 points to his right; the two statements being identical. Each of these rules will thus suffice to fix at any moment the direction of the storm center from the observer. It should, however, be borne in mind that the incurvature of the winds toward the center is greater over the land than over the water, and consequently in the case of the Great Lakes the proximity of the land will not permit the accuracy in fixing the center which is sometimes attained on the open sea.

Running out of a storm.—Any attempt to run out of a storm on the lakes will always be attended with risk on account of the lack of sea room and the danger of fetching up on a lee shore. Should the attempt be made, however, always keep the wind well on the starboard quarter in either semicircle, as this will preclude the pos-

sibility of running into the storm center, a position of the utmost danger, as we have there high, confused seas and most violent shifts of winds. Having a knowledge of the storm track and the changes to be expected, it may be possible either to lay the ship to or anchor her under a weather shore, with the assurance that the wind in shifting will have the effect to afford her a continuous lee under the land.

The following illustrates the character of these storms upon the Great Lakes, the laws which govern them, and the method of handling a ship when overtaken by them:



Management of the vessel and rules for heaving-to.—Figure 3 represents a storm, whether on the ocean or on the Great Lakes. For simplicity the general form is made perfectly circular and the winds are made to incurve two points everywhere. Let us suppose that this storm is advancing about north-northeast, in the direction of the long arrow, drawn in heavy, full line. Then the ship at *a* has the wind at east-northeast; she is to the left of the track, or, technically, in the left semicircle. The ship at *b* has the wind at east-southeast and is in the right semicircle. As the storm center advances along the heavy line, maintaining its area and shape, these ships, if lying-to closehauled, take the successive positions, a_1 , a_2 , etc., b_1 , b_2 , etc., respectively. The wind of ship *a* shifts to the left, as shown by the arrows; so in lying-to on the starboard tack, as

shown, her wind will draw ahead, and she may be struck aback, for the shifts are sometimes sudden and very heavy. Since the sea changes less rapidly than the wind, the old sea will draw aft as the ship falls off; she runs, therefore, in addition to the risk of being taken aback, that of getting stern-on to the heavy sea, a position of great danger, unless driving fast before it. Evidently ship *a* should be laid-to on the port tack in the left semicircle, in order that the wind may draw aft and that the ship, in coming up to the wind, shall keep head-on to the old sea.

The other ship, *b*, laid-to in the right semicircle, will have shifts of wind to the right, and being laid-to on the starboard tack, her wind in that semicircle will draw aft, as shown. As she comes up to the gradually shifting wind she will likewise come head-on to the old sea. Plainly, then, *b* is on the proper tack. Hence we have the rule: In the left semicircle, with respect to the storm track, the wind shifts to the left; lie-to, if at all, on the port tack (left tack). In the right semicircle the wind shifts to the right; lie-to, if at all, on the starboard tack (right tack).

There is a further advantage which may at times be taken of this known rotation of the winds, especially in lake navigation. A vessel on a weather shore, informed by her barometer that the storm center is moving rapidly and that rapid shifts may therefore be expected, will often profit by lying-to, anchoring under or hugging that shore, confident that the wind in shifting will afterwards afford her a continuous lee under the land.

Further differences between the front and the rear of the storm.—In addition to the fall of the barometer and the southerly winds, the approach of a barometric depression is marked by a rise in temperature of 5° to 10° F.; by the excessive moisture of the atmosphere, shown by the small difference between the wet-and-dry bulb thermometer; and particularly by the increasing quantity and the character and motion of the clouds, these having a soft, oily look, and coming from a direction one or two points to the right of the wind.

To recapitulate, we have, then, as the distinguishing features of the—

Front of the storm:

1. Falling barometer.
2. Southeasterly winds.
3. Falling temperature.
4. Increasing moisture (small difference between wet-and-dry bulbs).
5. Rain.
6. Clouds soft and veil like.

Bear of the storm:

1. Rising barometer.
2. Northwesterly winds.
3. Falling temperature.
4. Increasing dryness (large difference between wet-and-dry bulbs).
5. Rain ceasing.
6. Clouds hard and tending to break up.

When apprehensive of the weather, the mariner should make each of these points the subject of independent observation, not once only, but at hourly intervals. Having convinced himself that a storm is approaching, and having fixed his position to the best of his ability with regard to the storm center and its probable path, he is enabled to predict with some certainty what the direction of the coming winds and sea will be, to take due and seamanlike precautions, and, if necessary, to seek shelter before his vessel has been damaged, instead of after.

All of these points in connection with storms are best illustrated for lake mariners by a series of successive charts, showing the development of a storm over the lakes themselves and the changes in atmospheric pressure, temperature, and general meteorological conditions during its advance.

LAKE BAROMETER—WIND TABLE.

The following table, prepared by the Weather Bureau, presents in a form for ready reference the character of the wind and weather for the Great Lakes, indicated by the barometer:

Height of barometer (lake level).	Direction of wind.	Character of weather and wind indicated.
29.40 to 29.60 and steady.....	W.....	Fair, slight changes in temperature, gentle to fresh winds.
29.40 to 29.60, rising.....	W.....	Fair, cooler, fresh W. to NW. winds.
29.40 to 29.60, falling.....	S.....	Warmer, increasing southerly winds.
29.60, or above, falling rapidly.....	E to S.....	Warmer, rain or snow within thirty-six hours, increasing E. to SE. winds.
29.60, or above, rising rapidly.....	W. to N.....	Cold and clear, quickly followed by warmer, variable winds.
29.60, or above, steady.....	Variable.....	No immediate change, but winds will go to S. inside of thirty-six hours.
29.40, or below, falling slowly.....	S. to E.....	Rain or snow, increasing easterly winds.
29.40, or below, falling rapidly.....	S. to E.....	Rain or snow, high easterly winds, followed within forty-eight hours by clearing, colder, W. to NW. winds.
29.40, or below, rising slowly.....	S. to W.....	Clearing, colder, fresh to brisk W. to NW. winds.
29.20, or below, falling rapidly.....	S. to E.....	Severe storm of wind and rain, and wind shifting to NW. within thirty-six hours.
29.20, or below, falling rapidly.....	E. to N.....	Severe northeaster, with heavy rain or snow, and winds backing to NW.
29.20, or below, rising rapidly.....	Going to W.	Clearing and colder; probably cold wave in winter.

Barometers should be compared with a standard every few months. Rapid changes in the barometer indicate marked and early changes in the weather.

STORM-WARNING DISPLAY STATIONS.

MAINTAINED BY THE UNITED STATES AND CANADIAN GOVERNMENTS AT
POINTS ON THE GREAT LAKES.

DISPLAY SIGNALS.

United States—Small-craft warning.—A red pennant indicates moderately strong winds will interfere with safe operation of small craft. No night display.

Violent storms are indicated by day signals comprising a square red flag with black square center and either a red or a white pennant, and by night signals composed of lanterns, either red or red and white; the color and position of the pennants or lights showing the initial direction of the wind, as follows:

Northeast storm.—Red pennant above square flag; or two red lanterns, one above the other.

Southeast storm.—Red pennant below square flag; or one red lantern.

Southwest storm.—White pennant below square flag; or white lantern below red lantern.

Northwest storm.—White pennant above square flag; or white lantern above red lantern.

Hurricane warning.—Two square flags, one above the other; or two red lanterns with white lantern between; indicates an extremely severe or dangerous storm.

Canada.—The day signals consist of a cone displayed alone to indicate moderate gales with wind velocity from 25 to 35 miles an hour, and a drum suspended with the cone for heavy gales with wind exceeding 35 miles an hour. The night signals are composed of lanterns, either red or red and white. Wind directions are indicated as follows:

Easterly winds.—Cone pointing downward, either alone or with drum above it; or one red lantern.

Westerly winds.—Cone pointing upward, either alone or with drum below it; or white lantern below red lantern.

In the following list, night signals are displayed at stations where lights are specified.

LAKE SUPERIOR.

Ashland, Wis.—Steel tower, with lights.—On bay front at foot of Second Avenue West, near intersection with Front Street.

Baraga, Mich.—See Sand Point.

Bayfield, Wis.—Steel tower, with lights.—On south side of foot of Rittenhouse Avenue, directly west of inner end of city dock.

Deer Park, Mich.—Flagstaff.—On bluff back of coast-guard station, near mouth of Sucker River.

Duluth, Minn.—Steel tower, with lights.—On southwest side of Weather Bureau Building, corner Eighth Street and Seventh Avenue west. (See also Superior, below.)

Eagle Harbor, Mich.—Steel tower, with lights.—About 200 feet northwest of lighthouse.

Fort William, Ontario.—Signal mast, with lights.—At upper end of C. P. R. freight shed No. 5, 125 feet from the river.

Grand Marais, Mich.—Steel tower, with lights.—On coast-guard reservation, west side of harbor entrance, about 800 feet from lake.

Houghton, Mich.—Steel tower, with lights.—On roof of new Masonic Temple, corner Shelden and Portage Streets.

Keweenaw Waterway, Mich.—Steel tower, with lights.—On easterly side of Upper Entrance, about 100 feet south of coast-guard station. Steel tower, with lights.—At Portage Entry, near United States watchman's residence. (See also Houghton, above.)

Marquette, Mich.—Steel tower with lights.—On Marquette County Savings Bank Building, southeast corner of Washington and Front Streets.

Mendota Light Station, Mich.—Steel tower, with lights.—About 75 feet north of the lighthouse and 50 feet from the canal.

Munising, Mich.—Steel tower, with lights.—On east side of Beach Inn, about 240 feet from bay shore.

Port Arthur, Ontario.—Steel tower, with lights.—On roof of customhouse. Forecasts are broadcasted by radiotelegraph station at 11.30 p. m.

Presque Isle, Mich.—Steel tower, with lights.—Immediately across railroad track north of Lake Superior & Ishpeming depot.

Sand Point Light Station, Mich. (near Baraga).—Steel tower, with lights.—About 130 feet southeast of lighthouse.

Sault Ste. Marie, Mich. (St. Marys River).—Steel tower, with lights.—Twenty-five feet northwest of Weather Bureau Building, Canal grounds, Portage Avenue west.

Sault Ste. Marie, Ontario (St. Marys River).—Signal mast, with lights.—On southeast corner of Government wharf at foot of Pim Street. Forecasts are broadcasted by radiotelegraph station at 11.20 p. m.

Superior, Wis.—Steel tower, with lights.—On outer end of Great Northern Railway ore dock No. 1, facing Superior Entry. (See also Duluth, above.)

Two Harbors, Minn.—Steel tower, with lights.—On outer end of Duluth & Iron Range Railroad ore Dock No. 6.

Washburn, Wis.—Steel tower, with lights.—Near bay front, First Avenue east near Chicago, St. Paul, Minneapolis & Omaha Railway depot.

Whitefish Point, Mich.—Steel tower, with lights.—About 667 feet east-northeast of lighthouse.

. **LAKE MICHIGAN.**

Beaver Island (St. James), Mich.—Steel tower, with lights.—On Church Hill, 1 mile south of St. James.

Big Sable Point, Mich.—Steel tower, with lights.—On coast-guard reservation.

Calumet Harbor (South Chicago), Ill.—Steel tower, with lights.—On southwest corner of light-house reservation. (See also Chicago, below.)

Charlevoix, Mich.—Steel tower, with lights.—On bluff, south side of harbor, about 250 feet east of coast-guard station.

Chicago, Ill.—Steel tower, with lights.—On northeast corner of outer end of municipal pier No. 2. (See also Calumet, above.)

Escanaba, Mich.—Steel tower, with lights.—A short distance north of Ludington Street and west of Tilden Avenue.

Frankfort, Mich.—Steel tower, with lights.—At coast-guard station, south side of harbor entrance.

Gladstone, Mich.—Flagstaff, with lights.—On roof of elevator, "Soo Line" dock.

Glen Haven, Mich.—Steel tower, with lights.—On outer end of Day's Pier.

Grand Haven, Mich.—Steel tower, with lights.—On Cutler block, southwest corner Third and Washington Streets, $1\frac{1}{2}$ miles from pier entrance, 1,400 feet from docks.

Green Bay (city), Wis.—Steel tower, with lights.—On Minahan Building, 110-116 Walnut Street.

Harbor Springs, Mich.—Steel tower, with lights.—At foot of Spring Street.

Holland, Mich.—Steel tower, with lights.—At coast-guard station, Macatawa Park.

Kenosha, Wis.—Steel tower, with lights.—On old lighthouse tower, about 400 feet north of inner end of entrance channel.

Kewaunee, Wis.—Steel tower, with lights.—On south bluff near the lake and about two blocks from center of city.

Ludington, Mich.—Steel tower, with lights.—At coast-guard station, north side of harbor entrance.

Manistee, Mich.—Steel tower, with lights.—At coast-guard station, north side of harbor entrance.

Manitowoc, Mich.—Steel tower with lights.—At foot of North Seventh Street, about 15 feet from river dock.

Menominee, Mich.—Flagstaff, with lights.—On roof of fire department engine house, 250 feet from the bay shore and 3,700 feet north of the north pier.

Michigan City, Ind.—Steel tower, with lights.—On coast-guard reservation, about midway between station and sea wall to the north.

Milwaukee, Wis.—Steel tower, with lights.—On Jones Island, south of entrance channel, about 100 feet from shore line.

Muskegon, Mich.—Steel tower, with lights.—At coast-guard station, south side of harbor entrance.

North Manitou Island, Mich.—Steel tower, with lights.—On coast-guard reservation, northeast part of island.

Northport, Mich.—Steel tower.—At end of main dock.

Pentwater, Mich.—Steel tower, with lights.—On coast-guard reservation, north side of entrance channel.

Plum Island, Wis.—Steel tower, with lights.—On northeast point of island, 56 feet east of coast-guard station.

Racine, Wis.—Steel tower, with lights.—On northwest corner of coast-guard station.

St. Joseph, Mich.—Steel tower, with lights.—On bluff in Lake Front Park.

Sheboygan, Wis.—Steel tower, with lights.—At coast-guard station, north side of harbor entrance.

South Haven, Mich.—Steel tower, with lights.—On lighthouse reservation, south side of channel near the coast-guard station.

South Manitou Island, Mich.—Steel tower, with lights.—At south point of South Manitou Harbor on coast-guard reservation.

Sturgeon Bay, Wis.—Steel tower, with lights.—South side foot of Spruce Street, near corner of Main Street.

Traverse City, Mich.—Flagstaff.—On State Bank Building.

Two Rivers, Wis.—Steel tower, with lights.—In front of coast-guard station, north side of harbor entrance near the pier.

LAKE HURON.

Alpena, Mich.—Steel tower, with lights.—In rear of the Federal Building.

Bay City, Mich.—Steel tower, with lights.—On Jennison Hardware Co.'s Building, foot of Fifth Street.

Bayfield, Ontario.—Signal mast.—On south bank overlooking lake and harbor.

Cabot Head, Ontario.—Steel tower, with lights.—Eighty feet southwest of Cabot Head Lighthouse.

Cheboygan, Mich.—Steel tower, with lights.—Foot of Main Street.

Collingwood, Ontario.—Signal mast, with lights.—At foot of Hurontario Street, adjacent to the Government dock.

Duluth, Minn.—On Minnesota Point, about one-half mile south from Duluth Ship Canal.

Eagle Harbor, Mich.—On east point of harbor.

Grand Marais, Mich.—Four hundred feet west of rear range light.

Marquette, Mich.—Near inner end of United States breakwater.

Portage, Mich.—Near the lake shore on easterly side of northerly end of the Upper Canal, Keweenaw Waterway.

Two Hearted River, Mich.—Near mouth of Big Two Hearted River, 26½ miles easterly from Grand Marais, Mich.

Vermillion Point, Mich.—Ten miles west of Whitefish Point.

LAKE MICHIGAN.

Bailey Harbor, Wis.—On easterly side of harbor.

Beaver Island, Mich.—Near light in harbor.

Big Sable Point, Mich.—One mile south of light on Big Sable Point.

Calumet, Ill.—See South Chicago.

Charlevoix, Mich.—South side of entrance to harbor.

Chicago, Ill.—One on north side of yacht harbor, Jackson Park. One on south side of entrance to Chicago River, at north end of easterly breakwater. (See also South Chicago.)

Evanston, Ill.—On the Northwestern University grounds.

Frankfort, Mich.—South side of entrance to harbor.

Grand Haven, Mich.—North side of entrance to harbor.

Holland, Mich.—In the harbor, south side.

Kenosha, Wis.—In the harbor, on Washington Island.

Kewaunee, Wis.—North side of entrance to harbor.

Ludington, Mich.—North side of entrance to harbor.

Manistee, Mich.—North side of entrance to harbor.

Michigan City, Ind.—East side of entrance to harbor.

Milwaukee, Wis.—In McKinley Park, north end of breakwater.

Muskegon, Mich.—South side of entrance to harbor.

North Manitou Island, Mich.—Near Pickard's wharf.

Pentwater, Mich.—North side of entrance to harbor.

Plum Island, Wis.—Near northeast point of island, 2 miles northwest of Pilot Island Light.

Point Betsie, Mich.—Near the lighthouse.

Racine, Wis.—Near inner end of north pier.

St. Joseph, Mich.—In the harbor, north side.

Sheboygan, Mich.—Near inner end of old north pier stub.

Sleeping Bear Point, Mich.—About 1½ miles northwesterly from Glen Haven.

South Chicago, Ill.—North side of entrance to Calumet Harbor.

South Haven, Mich.—South side of entrance to harbor, near the shore line.

South Manitou Island, Mich.—South side of harbor.

Sturgeon Bay Canal, Wis.—At easterly entrance, on north side.

Two Rivers, Wis.—North side of entrance to harbor.

White River, Mich.—North side of entrance to White Lake.

LAKE HURON.

Bois Blanc Island, Mich.—At Walkers Point, east side of island.

Collingwood, Ontario.—At inner end of east breakwater.

Goderich, Ontario.—Boathouse on the south entrance pier.

Hammond Bay, Mich.—On east point of Hammond Bay.

Harbor Beach, Mich.—In the harbor, inner end of dock.

Kincardine, Ontario.—On east shore of harbor.

Lakeview Beach, Mich.—Five miles north of Fort Gratiot Light.

Mackinac Island, Mich.—In the harbor.

Middle Island, Mich.—On north end of the island.

Pointe aux Barques (Light), Mich.—Near the lighthouse.

Port Austin, Mich.—On Pointe aux Barques, about 2 miles northeast of Port Austin, and about 2 miles southeast of Port Austin Reef Light.

Southampton, Ontario.—On the beach between breakwater and mouth of Saugeen River.

Sturgeon Point, Mich.—Near the lighthouse.

Tawas Point, Mich.—Near the lighthouse.

Thunder Bay Island, Mich.—On the west side of the island.

LIFE-SAVING STATIONS.

Masters of vessels are particularly cautioned, if they should be driven ashore anywhere in the neighborhood of the stations, especially on any of the sandy coasts, where there is not much danger of vessels breaking up immediately, to remain on board until assistance arrives, and under no circumstances should they attempt to land through the surf in their own boats until the last hope of assistance from the shore has vanished. The difficulties of rescue by operations from the shore are greatly increased in cases where the anchors are let go after entering the breakers, as is frequently done, and the chances of saving life correspondingly lessened.

1. On the discovery of a wreck by night, the life saving service will burn a red light, or rocket, to signify "You are seen; assistance will be given as soon as possible."

2. A red flag on shore by day, or a red light, red rocket, or red roman candle displayed by night, will mean "Haul away."

3. A white flag on shore by day, or a white light slowly swung back and forth, or a white rocket, or a white roman candle by night, will signify "Slack away."

4. Two flags, a white and red, waved at the same time on shore by day, or two lights, a white and red, slowly swung at the same time, or a blue light burned by night, will signify "Do not attempt to land in your own boats; it is impossible."

5. A man on shore beckoning by day, or two torches burning near together by night, will signify "This is the best place to land."

6. Any of these signals may be answered from the vessel as follows:

7. In the daytime by waving a flag, a handkerchief, a hat, or even the hand; at night by firing a rocket, a blue light, or a gun, or by showing a light over the ship's gunwale for a short time and then concealing it.

8. On the lakes all stations are manned from the opening to the close of navigation, and are fully equipped with boats, wreck gun, beach apparatus, restoratives, etc. Houses of refuge are supplied with boats, provisions, and restoratives, but not manned by crews. A keeper, however, resides in each throughout the year, who, after every storm, is required to make extended excursions along the coast, with a view of ascertaining if any shipwreck has occurred, and finding and succoring any persons that may have been cast ashore.

Branch hydrographic offices are located on the Great Lakes as follows:

DULUTH.....	Room 1000, Torrey Building.
SAULT SAINTE MARIE.....	Room 10, Federal Building.
CHICAGO.....	Room 531, Post Office Building.
CLEVELAND.....	Rooms 406-408, Federal Building.
BUFFALO.....	Room 340, Post Office Building.

The branch offices do not sell any publications, but issue the Pilot Charts, Hydrographic Bulletins, Notices to Mariners, and Reprints to cooperating observers.

They are supplied with the latest information and publications pertaining to navigation, and masters and officers of vessels are cordially invited to visit them, and consult freely the officers in charge. Office hours, 9 a. m. to 4.30 p. m.

Masters of vessels should always obtain the latest corrections to their publications and charts before leaving these ports.

THE COMPASS—COMPASS ERROR.

EXPLANATION OF COMPASS TERMS.

Variation of the compass is the angle between the true north and the magnetic north. This difference or error arises from the magnetic

poles not coinciding with the terrestrial ones, and is due entirely to the influence of the earth on magnetic needles, which is the same only at few parts of the world.

Deviation of the compass is the angle included between the magnetic north and the compass north. This error is due to the disturbing influences of the iron of which the ship is built, as rudder posts, masts, chains, funnels, etc., her position when building, her cargo, or other causes within the ship.

Local attraction is the error caused by some disturbing force outside the ship, and belonging entirely to the locality at which a ship may be—as mooring posts or chains, dock cranes, another iron vessel alongside, volcanic or magnetic influences, etc.

Heeling error is the effect produced on the compass by the heeling of an iron or composite ship, the angle increasing with the amount of heel.

Leeway is the angle between the ship's course by compass and the direction which she makes through the water, as shown by her wake.

Compass course is the course steered by ship's compass.

Magnetic course is the compass course corrected for deviation and leeway.

The true course of a ship is the compass course corrected for deviation, leeway, and variation.

Irregularities of magnetic declination or variation, called local attraction.—There are many minor irregularities in the distribution of the magnetic declination or variation on the Great Lakes as shown by the devious courses of the lines of equal declination on the chart. At the exact point where the magnetic declination is observed, it is known with an accuracy of two or three minutes of arc. The method of observing, with a magnetometer, having a collimator magnet suspended by a silk fiber, gives a very accurate result. Another observation, however, at a point not very far away—a mile or so or even less—may give a declination differing by 30 minutes or more. This is owing to local sources of disturbance.

The direction of the magnetic needle at some places differs very much from the normal direction for the region. This is probably due to masses of magnetic iron ore, or rock strata containing iron, in the vicinity but out of sight, underground. Large irregularities of this kind are to be found on the north shore of Lake Superior, of such importance that a special investigation thereof has been made by the Duluth United States Engineer Office, the results being published in the Lake Survey Bulletin. At Grand Marais, Minn., the variation changes within a short distance from $3^{\circ} 45' \text{ W.}$ to $22^{\circ} 13' \text{ E.}$ At Corundum Point there is a change from 5° W. to 17° E. At Stony Point there is a change of variation from 6° E. to 27° E.

Other areas of large local disturbance are: Entrance to Nipigon Strait, west side of Fluor Island, and St. Ignace Island, variation $21\frac{1}{2}^{\circ}$ W.; a mile east of Pic Island, variation $19\frac{1}{2}^{\circ}$ W.; Rock of Ages, west of Isle Royal, variation 11° E. At the south point of Cockburn Island in the north end of Lake Huron, near Magnetic Reefs, there is a considerable irregularity, the declination being $2^{\circ} 11'$ E., while the normal for the vicinity is 4° W. Out on East Reef, however, the declination is about normal, being $5^{\circ} 46'$ W. A very pronounced disturbance exists at Kingston Harbor on Lake Ontario, as fully described under that heading. With a normal variation of between 9° and 10° W. for that vicinity, the needle swings at one point to 30° W., and at another to $16^{\circ} 45'$ E., this range of over four points occurring in a distance of $1\frac{1}{2}$ miles.

These large irregularities are along shore and do not extend out very far over the water, the declinations probably becoming normal three or four miles out. In deep water, any source of disturbance, being below the bottom of the lake, is not likely, unless very extensive, to have much effect on the needle at the surface, as the effect of the disturbing masses diminishes greatly with the increase of distance from the needle. Exceptional instances have, however, been noted on Lake Ontario, in an area lying about 10 miles north-northwest from Olcott, N. Y., and at another point in mid-lake to the southward of Port Hope, Ont.

APPLYING THE COMPASS ERROR.

There are three methods by which bearings or courses may be expressed: (*a*) true, when they refer to the angular distance from the earth's geographical meridian; (*b*) magnetic, when they refer to the angular distance from the earth's magnetic meridian, and must be corrected for variation to be converted into true; and (*c*) by compass, when they refer to the angular distance from the north indicated by the compass on a given heading of the ship, and must be corrected for the deviation on that heading for conversion to magnetic, and for both deviation and variation for conversion to true bearings or courses. The process of applying the errors under all circumstances is one of which the navigator must make himself a thorough master; the various problems of conversion are constantly arising; no course can be set nor bearing plotted without involving the application of this problem, and a mistake in its solution may produce serious consequences. The navigator is therefore urged to give it his most careful attention.

When the effect of a compass error, whether arising from variation or from deviation, is to draw the north end of the compass needle to the right, or eastward, the error is named east, or is marked +;

when its effect is to draw the north end of the needle to the left or westward, it is named west, or marked —.

Figures 7 and 8 represent, respectively, examples of easterly and westerly errors. In both cases consider that the circles represent the observer's horizon, N and S being the correct north and south points in each case. If N' and S' represent the corresponding points indicated by a compass whose needle is deflected by a compass error, then in the first case, the north end of the needle being drawn to the right or east, the error will be easterly or positive, and in the second case, the north end of the needle being drawn to the left or west, the compass error will be westerly or negative.

Considering figure 7, if we assume the easterly error to amount to one point, it will be seen that if a direction of N. by W. is indicated by the compass the correct direction should be north, or one point farther to the right. If the compass indicates north the correct bearing is N. by E.; that is, still one point to the right. If we follow

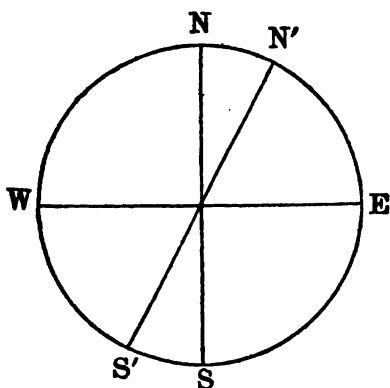


FIG. 7.

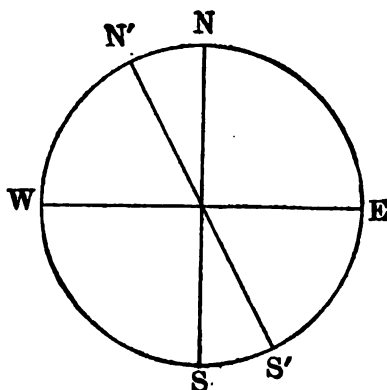


FIG. 8.

around the whole card the same relation will be found in every case, the corrected bearing being always one point to the right of the compass bearing. Conversely, if we regard figure 8, assuming the same amount of westerly error, a compass bearing of N. by E. is the equivalent of a correct bearing of north, which is one point to the left; and this rule is general throughout the circle, the corrected direction being always to the left of that shown by the compass.

Having once satisfied himself that the general rule holds, the navigator may save the necessity of reasoning out in each case the direction in which the error must be applied and need only charge his mind with some single formula which will cover all cases. Such a one is the following:

When the correct direction is to the right the error is east.

The words correct-right-east in such a case would be the key to all of his solutions. With easterly error, if he had a compass course to change to a corrected one, he would know that to obtain the result the error must be applied to the right; and if it were desired to change a correct course to one indicated by compass, the error would be applied to the left. If a correct bearing is to be compared with a compass bearing to find the compass error, when the correct bearing is to the right, the error is easterly; and when the correct bearing is to the left the error is westerly.

It must be remembered that the word east is equivalent to right in dealing with the compass error, and west to left, even though they involve an apparent departure from the usual rules. If a vessel steers NE. by compass with one point easterly error her corrected course is NE. by E.; but if she steers SE. the corrected course is not SE. by E. but SE. by S. Another caution may be necessary to avoid confusion. The navigator should always regard himself as facing the point under consideration when he applies an error; one point westerly error on South will bring a corrected direction to S. by E.; but if we applied one point to the left of South while looking at the compass card in the usual way—north end up—S. by W. would be the point arrived at, and a mistake of two points would be the result.

In the foregoing explanation reference has been made to "correct" directions and "compass errors" without specifying "magnetic" and "true" or "variation" and "deviation." This has been done in order to make the statements apply to all cases and to enable the student to grasp the subject in its general bearing without confusion of details.

Actually, as has already been pointed out, directions given may be true, magnetic, or by compass. By applying variation to a magnetic bearing we correct it and make it true, by applying a deviation to a compass bearing we correct it to magnetic, and by applying to it the combined deviation and variation we correct it to true. Whichever of these operations is undertaken, and whichever of the errors is considered, the process of correction remains the same; the correct direction is always to the right, when the error is east, by the amount of that error.

Careful study of the following examples will aid in making the subject clear:

EXAMPLES: A bearing taken by a compass free from deviation is 76° ; variation, 5° W.; required the true bearing. 71° .

A bearing taken by a similar compass is NW by W. $\frac{1}{2}$ W.; variation, $\frac{1}{4}$ pt. W.; required the true bearing. NW. by W. $\frac{3}{4}$ W.

A vessel steers 153° by compass; deviation on that heading, 3° W.; variation in the locality, 12° E.; required the true course. 162° .

A vessel steers S. by W. $\frac{1}{2}$ W.; deviation, $\frac{1}{2}$ pt. W.; variation, 1 pt. E.; required the true course. SSW. $\frac{1}{2}$ W.

It is desired to steer the magnetic course 322° ; deviation, 4° E.; required the course by compass. 318° .

The true course between two points is found to be W. $\frac{3}{4}$ N.; variation, $1\frac{1}{4}$ pt. E.; no deviation; required the compass course. W. $\frac{3}{4}$ S.

True course to be made, 55° ; deviation, 7° E.; variation, 14° W.; required the course by compass. 62° .

A vessel passing a range whose direction is known to be 200° magnetic, observes the bearing by compass to be 178° ; required the deviation. 22° E.

The sun's observed bearing by compass is 91° ; it is found by calculation to be 84° (true); variation, 8° W.; required the deviation. 1° E.

Changes in deviation due to changes of condition on board ship. In addition to changes in variation caused by local magnetic disturbance, there are great changes in deviation caused by changes in the distribution of magnetism on board ship. Any changes in the arrangement of the soft iron on the bridge or near the compass, any short circuits in the electric wiring near the compass, or lying alongside an iron pier, or iron vessel will disturb the compass and may introduce error sufficient to cause disaster.

A change in cargo may also cause error and with ore carriers it is most important that a mariner realize that a deviation curve for a vessel loaded with iron ore or other magnetic substances is bound to differ from the deviation curve for the same vessel in ballast or loaded with some non-magnetic substance like wheat.

Another cause of deviation is the use of electro-magnetic apparatus for handling cargo. The powerful magnets employed in this work not only affect the compass while in operation but induce temporary magnetism in the iron of the vessel which continues for a more or less indefinite period to affect the compass after the influence of the magnets has been removed.

A vessel should therefore be provided with a deviation table obtained by swinging ship, loaded with ore and loaded with non-magnetic cargo. But even this is not sufficient and at least twice daily the compass error should be obtained. The method of obtaining the compass error is so simple and requires so little time that no mariner is justified in neglecting to obtain it.

It is unnecessary to obtain the compass error on all courses daily but critical courses that are to be steered to make landfalls or to enter ports should be checked without fail.

In the narrow waters of the Great Lakes, where traffic is carried on schedule, and where the pressure on a master to make time is

great, too much effort can not be made to keep an accurate check on the compass.

Methods of obtaining compass error.—First method: Using a range whose true bearing is known. Compass error may be found by laying the vessel on a range whose true bearing is known and noting the compass course, the difference will be the compass error. The error may be obtained on any course by standing across the range on the desired course and noting the compass bearing of the range. The difference between the compass bearing and the true bearing is the compass error.

Second method: By observation of the sun or star. The true bearing of the sun can be obtained at any instant of the day by using H. O. Publication No. 71, "Azimuths of the Sun," the compass bearing can be observed with the Azimuth circle and the difference is the compass error. The variation can be obtained from the chart, and the deviation found for the heading by taking the difference between the compass error and the variation.

At night, H. O. Publication No. 120, "Azimuths of the Celestial Bodies," will give the true bearing of any star within certain limits of declination and latitude, the compass bearing can be obtained by observation, and the compass error ascertained as with the sun.

The heavenly body should be observed on or near the prime vertical where the bearings change least.

PRACTICAL METHOD FOR CORRECTING COMPASSES.

In addition to checking the compass daily, at frequent intervals the ship should be swung, the compass adjusted and a deviation table obtained. If a professional compass adjuster can be obtained, time can probably be saved by employing one; if not the master of the vessel may use the following method to correct the compass.

DIRECTIONS FOR USE OF COMPENSATING BINNACLES WITH FORE AND AFT AND ATHWARTSHIP MAGNET CORRECTORS AND QUADRANTAL SPHERES, ETC.

A compass mounted in a binnacle of the above type on an iron or steel vessel may be corrected for deviations by following the instructions given below.

The vessel should be on an even keel. Secure all movable local masses in the vicinity of the compass in the position they will invariably occupy when out in the lake.

TO PLACE THE SHIP'S HEAD ON ANY MAGNETIC POINT OF THE COMPASS.

Select beforehand the locality and date on which the compass is to be corrected, and choose certain intervals of local apparent time to cover the operation.

With the selected latitude and declination, enter the azimuth tables and pick out the sun's true bearing for the local apparent time selected.

Apply the variation for the locality to the true bearings and obtain the magnetic bearings of the sun, observing the rule that easterly variation must be applied to the left and westerly variation to the right to obtain the magnetic bearing.

Record these magnetic bearings and local apparent times for the date of observation and on that date proceed to the locality previously decided upon and set the watch to local apparent time. Shortly before the earliest time selected set that point of the pelorus corresponding to the magnetic point required to the ship's head. Set the sight vanes of the pelorus to correspond with the magnetic bearing of the sun for the selected local apparent time. Clamp the plate and sight vanes of the pelorus.

Turn the ship to bring the sight vanes on the sun, keeping them there by the helm. At the instant selected the ship's head will correspond with the magnetic direction required. Record the readings of the standard and steering compasses at that instant.

First.—Correct, approximately, the quadrantal deviation by placing the spheres on the side brackets and secure them about the middle of the arms.

Second.—Place the heeling magnet in its tube, north end up, in north magnetic latitude, and lower it to the bottom.

TO CORRECT SEMICIRCULAR DEVIATION.

1. Head the vessel 0° (North), magnetic. If the compass shows easterly deviation, enter one or more athwartship magnets, north or red ends to starboard, then move the magnets up or down until the compass points 0° (North).

If the compass shows westerly deviation, enter the athwartship magnets with the north or red ends to port. Raise or lower them until the compass points 0° (North).

Or, head the vessel 180° (South), magnetic, and enter the athwartship magnets with the north or red ends to port to correct easterly deviation, or to starboard to correct westerly deviation.

2. Next, head the vessel 90° (East), magnetic. If easterly deviation is shown enter the fore and aft magnets with the red or north ends forward; if westerly deviation is shown enter the magnets with the north ends aft. Raise or lower the magnets until the compass points 90° (East).

Or head the vessel 270° (West), magnetic, enter the fore and aft magnets north ends aft to correct easterly deviation, or north ends forward to correct westerly deviation.

TO CORRECT QUADRANTAL DEVIATION.

1. Having corrected the semicircle deviation, by the foregoing methods, next head the vessel 45° (NE.), 135° (SE.), 225° (SW.), 315° (NW.), and if deviation is shown move the spheres in or out until the compass points 45° (NE.), 135° (SE.), 225° (SW.), 315° (NW.).

2. If the spheres over correct when placed at the outer limits of the brackets, smaller spheres should be used. If the spheres under correct when closed in, larger ones are needed.

TO CORRECT HEELING ERROR.

When a vessel at sea rolls moderately the presence of heeling error will be shown by a marked vibration of the compass card. A 0° (North) or 180° (South) course is most favorable course to steer to observe this effect.

Raise the heeling magnet until the vibrations almost disappear, leaving an amplitude of 1° or 2° to avoid over correction and to allow for displacement of ship's head in rolling.

If raising the heeling magnet from the bottom of the tube aggravates the heeling error, the wrong pole is uppermost.

Note.—In correcting semicircular deviation, divide the magnets equally on each side of the vertical axis of the binnacle where receptacles are fitted.

It is better to use a greater number of magnets at a distance than a smaller number near the compass.

The ship should invariably be swung on the sixteen principal points for a final table of deviations at the earliest opportunity after compensation.

Check all courses steered by frequent azimuths.

Compass card.—The circular card of the compass is divided on its periphery into 360° , frequently numbered from 0° at north and south to 90° at east and west; also into 32 divisions of $11\frac{1}{4}^{\circ}$ each, called points, the latter being further divided into half-points and quarter-points; still finer subdivisions, eighth-points are sometimes used, though not indicated on the card. A system of numbering the degrees from 0° to 360° , always increasing toward the right, is shown on all Hydrographic Office Charts. This system is in use in the United States Navy and by the mariners of some foreign nations, and its general adoption would carry with it certain undoubted advantages.

Table of points and degrees.—The names of the whole points, together with fractional points (according to the nomenclature of the U. S. Navy) are given in the following table, which shows also the degrees, minutes, and seconds from north or south, to which each division corresponds.

THE COMPASS.

Points.	Number.	Degrees.	Number.	Points.
North.	0	0 0 0	0	South.
	$\frac{1}{8}$	1 24 22	$\frac{1}{8}$	
	$\frac{1}{4}$	2 48 45	$\frac{1}{4}$	
	$\frac{3}{8}$	4 13 7	$\frac{3}{8}$	
	$\frac{1}{2}$	5 37 30	$\frac{1}{2}$	
	$\frac{5}{8}$	7 1 52	$\frac{5}{8}$	
	$\frac{3}{4}$	8 26 15	$\frac{3}{4}$	
	$\frac{7}{8}$	9 50 37	$\frac{7}{8}$	
N. by E. N. by W.	1	11 15 0	1	S. by W. S. by E.
	$\frac{1}{8}$	12 39 22	$\frac{1}{8}$	
	$\frac{1}{4}$	14 3 45	$\frac{1}{4}$	
	$\frac{3}{8}$	15 28 7	$\frac{3}{8}$	
	$\frac{1}{2}$	16 52 30	$\frac{1}{2}$	
	$\frac{5}{8}$	18 16 52	$\frac{5}{8}$	
	$\frac{3}{4}$	19 41 15	$\frac{3}{4}$	
	$\frac{7}{8}$	21 5 37	$\frac{7}{8}$	
NNE. NNW.	2	22 30 0	2	SSW. SSE.
	$\frac{1}{8}$	23 54 22	$\frac{1}{8}$	
	$\frac{1}{4}$	25 18 45	$\frac{1}{4}$	
	$\frac{3}{8}$	26 43 7	$\frac{3}{8}$	
	$\frac{1}{2}$	28 7 30	$\frac{1}{2}$	
	$\frac{5}{8}$	29 31 52	$\frac{5}{8}$	
	$\frac{3}{4}$	30 56 15	$\frac{3}{4}$	
	$\frac{7}{8}$	32 20 37	$\frac{7}{8}$	
NE. by N. NW. by N.	3	33 45 0	3	SW. by S. SE. by S.
	$\frac{1}{8}$	35 9 22	$\frac{1}{8}$	
	$\frac{1}{4}$	36 33 45	$\frac{1}{4}$	
	$\frac{3}{8}$	37 58 7	$\frac{3}{8}$	
	$\frac{1}{2}$	39 22 30	$\frac{1}{2}$	
	$\frac{5}{8}$	40 46 52	$\frac{5}{8}$	
	$\frac{3}{4}$	42 11 15	$\frac{3}{4}$	
	$\frac{7}{8}$	43 35 37	$\frac{7}{8}$	
NE. NW.	4	45 0 0	4	SW. SE.
	$\frac{1}{8}$	46 24 22	$\frac{1}{8}$	
	$\frac{1}{4}$	47 48 45	$\frac{1}{4}$	
	$\frac{3}{8}$	49 13 7	$\frac{3}{8}$	
	$\frac{1}{2}$	50 37 30	$\frac{1}{2}$	
	$\frac{5}{8}$	52 1 52	$\frac{5}{8}$	
	$\frac{3}{4}$	53 26 15	$\frac{3}{4}$	
	$\frac{7}{8}$	54 50 37	$\frac{7}{8}$	
NE. by E. NW. by W.	5	56 15 0	5	SW. by W. SE. by E.
	$\frac{1}{8}$	57 39 22	$\frac{1}{8}$	
	$\frac{1}{4}$	59 3 45	$\frac{1}{4}$	
	$\frac{3}{8}$	60 28 7	$\frac{3}{8}$	
	$\frac{1}{2}$	61 52 30	$\frac{1}{2}$	
	$\frac{5}{8}$	63 16 52	$\frac{5}{8}$	
	$\frac{3}{4}$	64 41 15	$\frac{3}{4}$	
	$\frac{7}{8}$	66 5 37	$\frac{7}{8}$	
ENE. WNW.	6	67 30 0	6	WSW. ESE.
	$\frac{1}{8}$	68 54 22	$\frac{1}{8}$	
	$\frac{1}{4}$	70 18 45	$\frac{1}{4}$	
	$\frac{3}{8}$	71 43 7	$\frac{3}{8}$	
	$\frac{1}{2}$	73 7 30	$\frac{1}{2}$	
	$\frac{5}{8}$	74 31 52	$\frac{5}{8}$	
	$\frac{3}{4}$	75 56 15	$\frac{3}{4}$	
	$\frac{7}{8}$	77 20 37	$\frac{7}{8}$	
E. by N. W. by N.	7	78 45 0	7	W. by S. E. by S.
	$\frac{1}{8}$	80 9 22	$\frac{1}{8}$	
	$\frac{1}{4}$	81 33 45	$\frac{1}{4}$	
	$\frac{3}{8}$	82 58 7	$\frac{3}{8}$	
	$\frac{1}{2}$	84 22 30	$\frac{1}{2}$	
	$\frac{5}{8}$	85 46 52	$\frac{5}{8}$	
	$\frac{3}{4}$	87 11 15	$\frac{3}{4}$	
	$\frac{7}{8}$	88 35 37	$\frac{7}{8}$	
East. West.	8	90 0 0	8	West. East.

Local apparent time.—In order to render the azimuth tables convenient for the use of those whose timepieces are regulated to standard time, the corrections to be applied to the standard time of the seventy-fifth meridian and the standard time of the ninetieth meridian to reduce to the local mean time of the meridians stated are given in the following tables.

The local apparent time, with which the azimuth tables are entered, is obtained from the local mean time by applying the value of the equation of time, for the date of observation, given in the Nautical Almanac.

Corrections to be subtracted from seventy-fifth meridian time to reduce it to local mean time in the following longitudes:

Longitude W.	Correction.	Longitude W.	Correction.
° ' .	<i>Minutes.</i>	° ' .	<i>Minutes.</i>
76 00.....	4	80 00.....	20
76 30.....	6	80 30.....	22
77 00.....	8	81 00.....	24
77 30.....	10	81 30.....	26
78 00.....	12	82 00.....	28
78 30.....	14	82 30.....	30
79 00.....	16	83 00.....	32
79 30.....	18	83 30.....	34

Corrections to be added to ninetieth meridian time to reduce it to local mean time in the following longitudes:

Longitude W.	Correction.	Longitude W.	Correction.
° ' .	<i>Minutes.</i>	° ' .	<i>Minutes.</i>
78 00.....	48	84 00.....	24
78 30.....	46	84 30.....	22
79 00.....	44	85 00.....	20
79 30.....	42	85 30.....	18
80 00.....	40	86 00.....	16
80 30.....	38	86 30.....	14
81 00.....	36	87 00.....	12
81 30.....	34	87 30.....	10
82 00.....	32	88 00.....	8
82 30.....	30	88 30.....	6
83 00.....	28	89 00.....	4
83 30.....	26	89 30.....	2

Corrections to be subtracted from ninetieth meridian time to reduce it to local mean time in the following longitudes:

Longitude W.	Correction.	Longitude W.	Correction.
° ' .	<i>Minutes.</i>	° ' .	<i>Minutes.</i>
90 30.....	2	92 00.....	8
91 00.....	4	92 30.....	10
91 30.....	6		

Measuring distances.—The latitude scales, which bound the charts on the east and west, are to be used for measuring distances between places. If the places are on the same meridian, their distance apart is most readily estimated by finding the difference of latitude in minutes. Distances between points situated on lines that make an angle with the meridians may be measured by taking between the points of the dividers a small number of subdivisions near the middle latitude of the line to be measured and stepping them off on that line.

All distances measured by means of the latitude scale are in nautical miles, which can be readily converted into statute miles by multiplying by 1.15 or by the following tables:

Table to convert statute miles into nautical miles.

1 statute mile = 5,280 feet.
1 nautical mile or knot = 6,080 feet.

Statute miles.	Nautical miles.	Statute miles.	Nautical miles.	Statute miles.	Nautical miles.
1.00	0.868	9.00	7.815	17.00	14.763
1.25	1.085	9.25	8.032	17.25	14.980
1.50	1.302	9.50	8.249	17.50	15.197
1.75	1.519	9.75	8.467	17.75	15.414
2.00	1.736	10.00	8.684	18.00	15.632
2.25	1.953	10.25	8.901	18.25	15.849
2.50	2.171	10.50	9.118	18.50	16.066
2.75	2.387	10.75	9.335	18.75	16.283
3.00	2.604	11.00	9.552	19.00	16.500
3.25	2.821	11.25	9.769	19.25	16.717
3.50	3.038	11.50	9.986	19.50	16.934
3.75	3.256	11.75	10.203	19.75	17.151
4.00	3.473	12.00	10.420	20.00	17.369
4.25	3.690	12.25	10.638	20.25	17.586
4.50	3.907	12.50	10.855	20.50	17.803
4.75	4.124	12.75	11.072	20.75	18.020
5.00	4.341	13.00	11.289	21.00	18.237
5.25	4.559	13.25	11.507	21.25	18.454
5.50	4.776	13.50	11.724	21.50	18.671
5.75	4.994	13.75	11.941	21.75	18.888
6.00	5.211	14.00	12.158	22.00	19.105
6.25	5.428	14.25	12.376	22.25	19.322
6.50	5.645	14.50	12.593	22.50	19.539
6.75	5.862	14.75	12.810	22.75	19.756
7.00	6.079	15.00	13.027	23.00	19.973
7.25	6.296	15.25	13.244	23.25	20.191
7.50	6.513	15.50	13.461	23.50	20.408
7.75	6.730	15.75	13.678	23.75	20.625
8.00	6.947	16.00	13.895	24.00	20.842
8.25	7.164	16.25	14.112	24.25	21.060
8.50	7.381	16.50	14.329	24.50	21.277
8.75	7.598	16.75	14.546	25.00	21.711
$\frac{1}{2}$	0.217	$\frac{1}{2}$	0.434	$\frac{1}{2}$	0.651

DRAFT IN SALT AND FRESH WATER.

Table to convert nautical miles into statute miles.

1 nautical mile or knot=6,080 feet.
1 statute mile =5,280 feet.

Nautical miles.	Statute miles.	Nautical miles.	Statute miles.	Nautical miles.	Statute miles.
1.00	1.151	8.75	10.075	16.50	18.999
1.25	1.439	9.00	10.363	16.75	19.287
1.50	1.729	9.25	10.651	17.00	19.575
1.75	2.015	9.50	10.939	17.25	19.863
2.00	2.303	9.75	11.227	17.50	20.151
2.25	2.590	10.00	11.515	17.75	20.439
2.50	2.878	10.25	11.803	18.00	20.727
2.75	3.166	10.50	12.090	18.25	21.015
3.00	3.454	10.75	12.378	18.50	21.303
3.25	3.742	11.00	12.666	18.75	21.590
3.50	4.030	11.25	12.954	19.00	21.878
3.75	4.318	11.50	13.242	19.25	22.166
4.00	4.606	11.75	13.530	19.50	22.454
4.25	4.893	12.00	13.818	19.75	22.742
4.50	5.181	12.25	14.106	20.00	23.030
4.75	5.469	12.50	14.393	20.25	23.318
5.00	5.757	12.75	14.681	20.50	23.606
5.25	6.045	13.00	14.969	20.75	23.893
5.50	6.333	13.25	15.257	21.00	24.181
5.75	6.621	13.50	15.545	21.25	24.468
6.00	6.909	13.75	15.833	21.50	24.757
6.25	7.196	14.00	16.121	21.75	25.045
6.50	7.484	14.25	16.409	22.00	25.333
6.75	7.772	14.50	16.696	22.25	25.621
7.00	8.060	14.75	16.984	22.50	25.909
7.25	8.348	15.00	17.272	22.75	26.196
7.50	8.636	15.25	17.560	23.00	26.484
7.75	8.924	15.50	17.848	23.50	27.000
8.00	9.212	15.75	18.136	24.00	27.636
8.25	9.500	16.00	18.424	24.50	28.212
8.50	9.787	16.25	18.712	25.00	28.787

DRAFT IN SALT AND FRESH WATER.

With regard to the amount a vessel will rise in passing from fresh to salt water, the following table shows approximately:

Molded depth in feet.	Approximate amount of rise of a vessel passing from fresh to salt water.		
	Vessels with-out erections on deck.	Awning deck vessels.	Spar deck ves-sels.
	Inches.	Inches.	Inches.
9 and under 11.....	2		
11 and under 13.....	2½		
13 and under 16.....	3	3½	4
16 and under 19.....	3½	4	4½
19 and under 22.....	4	4½	5
22 and under 25.....	4½	5	5½
25 and under 28.....	5	5½	6
28 and under 31.....	5½	6	6½
31 and under 34.....	6	6½	7

The weight of a cubic foot of salt water being taken to be 64 pounds, that of fresh water, 62.5 pounds.

This table applies, as a general rule, for all except those of extremely full or extremely fine form.

Rules for navigating the Great Lakes.—Including Georgian Bay, their connecting and tributary waters, and the St. Lawrence River as far east as the lower exit of the Lachine Canal and the Victoria Bridge at Montreal, see Form 808, Department of Commerce, Steamboat-Inspection Service.

For "International Rules of the Road" applicable to the St. Lawrence River below Montreal, see Department of Commerce Circular No. 230.

Regulations governing the display of signals on, and the operations of, all dredges, derrick boats, snag boats, drill boats, pile drivers, maneuver boats, hydraulic graders, seagoing dredges, and survey boats while at work in navigable waters of the United States.

Rules approved by the Secretary of Commerce, July 28, 1914, and published by the Supervising Inspector General, Steamboat-Inspection Service, July 30, 1914, will be found in detail in United States Corps of Engineers "Bulletin Survey of Northern and Northwestern Lakes."

Laws of the United States.—Extracts relating to private construction in navigable waters, establishment of harbor lines, creating obstructions to navigation, occupancy or injury of public works, marking and removal of wrecks, bridges obstructing navigation, and regulations to be prescribed by Secretary of War covering canals and channels, drawbridges, rafts and logs, dumping, etc. See "Bulletin Survey of Northern and Northwestern Lakes," published by United States Corps of Engineers, War Department.

TABLE I.—Distances between

		36	35	34	33	32	31	30	29	28	27	26	25
		Montreal.	Ogdensburg.	Kingston.	Toronto.	Oswego.	Charlotte.	Port Colborne.	Buffalo.	Erie.	Conneaut.	Ashtabula.	Fairport.
1	Port Arthur.....	1217	1098	1040	906	1020	968	849	866	797	769	756	731
2	Two Harbors.....	1315	1196	1138	1004	1118	1067	947	964	895	868	854	830
3	Duluth.....	1339	1220	1162	1028	1142	1090	971	988	918	891	878	853
4	Ashland.....	1294	1175	1116	982	1096	1045	926	943	873	846	832	808
5	Houghton.....	1166	1047	988	854	968	917	798	815	745	718	704	680
6	Marquette.....	1104	985	927	793	907	855	736	753	683	656	643	618
7	Sault Ste. Marie ¹	945	826	767	633	747	696	577	594	524	497	483	459
8	Escanaba.....	1051	932	874	740	854	802	683	701	631	603	590	565
9	Green Bay.....	1120	1001	943	809	923	871	752	769	699	672	659	634
10	Milwaukee.....	1181	1062	1004	869	984	932	813	830	760	733	719	695
11	Chicago.....	1246	1127	1069	935	1049	997	878	895	825	798	785	760
12	Gary.....	1258	1139	1081	947	1061	1009	890	907	838	810	797	772
13	Muskegon.....	1146	1027	969	835	949	898	778	795	726	699	685	661
14	Ludington.....	1095	976	918	784	898	846	727	744	675	647	634	609
15	Alpena.....	832	713	655	521	635	583	464	481	412	384	371	346
16	Bay City.....	837	718	660	526	640	588	469	486	417	389	376	351
17	Goderich.....	740	621	563	429	543	491	372	389	320	292	279	254
18	Collingwood.....	933	814	756	622	736	684	565	582	513	485	472	447
19	Midland.....	941	822	764	630	744	692	573	590	521	493	480	455
20	Port Huron ²	675	556	498	364	478	426	307	324	255	227	214	189
21	Detroit (Woodward Ave.).....	612	493	435	301	415	363	244	261	191	164	150	126
22	Toledo (River Mouth).....	605	486	427	293	407	356	237	254	185	157	144	119
23	Lorain.....	548	429	371	237	351	300	180	197	124	95	80	53
24	Cleveland (Main Entrance).....	528	409	351	217	331	279	160	176	102	73	59	33
25	Fairport.....	498	379	321	187	301	249	130	146	73	44	30	...
26	Ashtabula.....	472	353	294	160	274	223	104	119	45	15	...	...
27	Conneaut.....	460	341	283	149	263	211	92	107	33	...	...	...
28	Erie.....	433	314	256	122	236	184	65	78	...	...	...	...
29	Buffalo (North Entrance).....	390	271	213	79	193	141	22	...	...	...	...	...
30	Port Colborne.....	368	249	191	57	171	119	...	...	...	...	...	...
31	Charlotte.....	266	147	89	95	59	...	...	...	...	...	...	...
32	Oswego.....	227	108	55	145	...	...	...	...	...	...	...	...
33	Toronto.....	338	219	161	...	...	...	...	...	...	...	...	...
34	Kingston.....	182	63	...	...	...	...	...	...	...	...	...	...
35	Ogdensburg.....	120	...	...	...	...	...	...	...	...	...	...	...
36	Montreal.....	0	...	...	...	...	...	...	...	...	...	...	...

¹ From abreast east end of U. S. center pier.² From Fort Gratiot range.

points on Great Lakes.

[illegible]

EXPLANATION.

Distances in these tables are expressed to the nearest even statute mile; fractions of $\frac{1}{2}$ mile or more being taken as a full mile and those under the half dropped. The results are, therefore, at times inconsistent by 1 mile in their comparative differences. Thus, measured distances to two given points may differ uniformly by 0.8 mile; if the respective distances to the two points from a certain port measure 116.0 and 115.2, they appear in the table as 116 and 115, a difference of 1 mile; whereas, from the next port listed the distances to the same two points may measure 105.4 and 104.6, and both will appear in the table as 105.

Measurements are by the shortest marked or safe direct courses, starting (unless otherwise noted) from the main entrances between pierheads of breakwaters or piers, or from the principal landings of open roadsteads. Where landings are appreciably remote from protected entrances, the appropriate further distances, if desired, may be ascertained from the harbor descriptions or from charts.

Points in this table are arranged in the order of their location on the several lakes in the following sequence: Lake Superior, Lake Michigan, Lake Huron, Lake Erie, and Lake Ontario.

The distance between any two points appears in the line extending horizontally from the point first in order in the list and in the column headed by the other point.

TABLE II.—Distances between

		37 36 35	34 33 32	81 30 29	28 27 26
		Gargantua Harbor. Michipicoten Harbor. Quebec Harbor.	Peninsula Harbor. Roesport. Port Arthur.	Fort William. Passage Island. Rock of Ages.	Grand Marais, Minn. Two Harbors. Duluth.
Other tables to which initial points Nos. 1-4 are common: III—Lake Michigan. IV—Lake Huron and St. Marys River. V—Lake Erie, St. Clair, Detroit, and Niagara Rivers. VI—Lake Ontario and St. Lawrence River.					
1	Port Colborne (VI).....	668 698 692	772 813 849	848 806 839	881 947 971
2	Port Huron (V) ¹	360 391 385	465 503 542	541 498 532	574 640 664
3	Old Mackinac Point (III) ²	181 212 206	285 324 363	362 319 353	395 461 485
4	Sault Ste. Marie (IV) ³	91 121 116	195 234 273	272 229 263	305 371 394
5	Whitefish Point.....	54 83 74	153 192 231	230 187 221	263 329 352
6	Grand Marais, Mich.....	78 102 70	144 171 198	197 154 182	224 *289 *312
7	Munising.....	112 136 97	162 179 193	192 150 174	*212 *271 *293
8	Marquette (docks).....	135 154 112	180 164 171	170 128 *149	*181 *239 *261
9	Huron Bay (village).....	165 179 132	159 152 157	*156 113 *110	*142 *201 *221
10	L'Anse.....	179 192 146	169 162 *145	*144 108 *95	*127 *186 *206
11	Mendota Canal.....	138 152 105	125 117 122	121 78 103	145 212 234
12	Copper Harbor.....	137 145 100	112 99 100	99 56 77	119 185 208
13	Eagle Harbor.....	151 159 114	122 102 96	95 53 65	105 170 194
14	Portage Entry.....	168 181 135	157 149 *130	*129 94 *81	*113 *171 *193
15	Chassell.....	177 190 143	166 145 125	124 89 76	106 166 188
16	Lake Linden.....	185 198 151	174 151 131	130 95 82	113 172 194
17	Dollar Bay.....	180 192 146	163 139 119	118 83 70	102 160 182
18	Houghton.....	182 195 149	160 136 116	115 80 67	99 157 179
19	Portage Upper Entrance.....	180 187 142	149 126 105	105 69 56	88 147 169
20	Ontonagon.....	221 228 183	189 165 117	116 103 68	76 114 136
21	Ashland.....	295 304 258	261 227 164	163 165 115	85 71 93
22	Washburn.....	291 300 254	256 222 160	159 161 111	81 67 89
23	Bayfield.....	282 291 246	254 221 149	148 152 99	70 57 78
24	Port Wing.....	312 319 275	272 233 169	168 175 121	83 22 34
25	Superior.....	340 347 303	300 259 195	195 199 147	107 28 7
26	Duluth.....	342 349 305	300 259 195	194 200 147	105 26 ...
27	Two Harbors.....	319 327 281	277 236 172	171 177 124	82 ...
28	Grand Marais, Minn.....	252 256 214	199 157 92	91 99 47	...
29	Rock of Ages.....	209 213 171	155 112 49	48 53 ...	...
30	Passage Island.....	164 166 127	102 63 44	43 ...	...
31	Fort William.....	207 209 170	141 101 3	...	...
32	Port Arthur.....	208 209 171	142 102 ...	...	...
33	Roesport.....	157 155 125	71 ...	...	...
34	Peninsula Harbor.....	114 112 86	...	...	...
35	Quebec Harbor.....	41 49 ...	...	...	...
36	Michipicoten Harbor.....	32 ...	...	...	...
37	Gargantua Harbor.....	0 ...	...	...	...

¹ From Fort Gratiot range.² From sailing course point north of light.³ From abreast east end of U. S. center pier.

* Via Keweenaw Waterway.

points on Lake Superior.

	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4
Superior.																						
Port Wing.																						
Bayfield.																						
Washburn.																						
Ashland.																						
Ontonagon.																						
Portage Upper Entrance.																						
Houghton.																						
Dollar Bay.																						
Lake Linden.																						
Chassell.																						
Portage Entry.																						
Eagle Harbor.																						
Copper Harbor.																						
Mendota Canal.																						
L'Anse.																						
Huron Bay.																						
Marquette.																						
Munising.																						
Grand Marais, Mich.																						
Whitefish Point.																						
Sault Ste. Marie.																						
999	941	913	922	926	851	808	798	794	800	792	783	781	766	765	794	781	736	707	668	619	577	
662	633	606	614	618	544	501	490	487	493	485	476	473	458	458	486	473	429	400	361	311	269	
463	454	426	435	439	365	322	311	308	314	306	297	294	279	279	307	294	249	221	182	134	90	
393	364	336	345	349	*274	*232	221	218	224	215	207	204	189	189	217	204	159	131	92	42	....
351	322	294	303	307	*232	*190	179	176	182	173	165	162	147	147	175	162	117	89	50	....	....
*310	*282	*252	*260	*264	*187	*143	133	130	135	127	119	123	106	105	129	114	68	40	..	..	....
*294	*263	*233	*240	*245	*168	*124	114	111	116	108	99	113	100	93	110	93	42	..	..	..	....
*280	*231	*201	*209	*213	*136	*93	84	81	84	76	68	91	76	67	78	62	..	..	..	..	....
*222	*193	*163	*171	*175	*98	*54	44	41	46	38	30	74	60	44	39	..	..	..	..	..	....
*206	*178	*148	*156	*160	*83	*39	29	26	31	23	14	70	71	51	..	..				

EXPLANATION.

Explanation generally applicable to all tables is published in Table I.

Points in this table are arranged in geographical sequence proceeding westward along the south shore and returning eastward around the north shore.

For determined distances to points located in other lakes, distances from all places listed in this table are given to the initial points Nos. 1 to 4, which also appear in the other tables respectively indicated by numeral designation. The through distance from a given point in this table to a given point in any other table is the sum of the respective distances to each given point from the initial point which is common to the two tables. Thus, Port Huron being the common point for determining distances from Lake Superior points to points in Lake Erie (table V), a through distance would be derived as follows:

Port Huron to Ontonagon.....	544
Port Huron to Dunkirk.....	294

Port Huron to Ontonagon.....	542
Port Huron to Dunkirk.....	294

Ontonagon to Dunkirk.....	838
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TABLE III.—Distances between

	37	36	35	34	33	32	31	30	29	28	27	26
Other tables to which initial point No. 1 is common: II—Lake Superior. IV—Lake Huron and St. Marys River. V—Lake Erie, St. Clair, Detroit, and Niagara Rivers. VI—Lake Ontario and St. Lawrence River.	Beaver Island Harbor. Potoskey. Charlevoix.			Traverse City. Frankfort. Portage Lake.			Manistee. Ludington. Pentwater.			White Lake. Muskegon. Grand Haven.		
1 Old Mackinac Point (II-IV-V-VI) ¹	41	55	56	97	122	142	150	173	184	213	224	238
2 Manistique.....	43	76	64	94	91	110	118	141	152	182	193	207
3 Escanaba.....	99	113	99	120	91	106	112	230	141	170	181	195
4 Menominee ²	*122	*134	*119	*138	80	86	87	98	108	135	146	159
5 Green Bay (city) ²	*165	176	160	178	105	111	112	123	134	159	171	184
6 Sturgeon Bay (town).....	123	129	113	131	58	64	65	76	87	113	124	137
7 Algoma.....	131	135	119	136	59	60	59	66	75	100	111	123
8 Kewaunee.....	138	143	126	143	62	60	58	61	70	93	104	116
9 Two Rivers.....	156	159	142	160	75	67	62	57	61	78	89	101
10 Manitowoc.....	161	163	147	164	79	71	66	60	64	79	90	102
11 Sheboygan.....	180	181	165	182	95	83	76	60	63	68	78	87
12 Port Washington.....	206	205	189	206	119	104	98	80	76	72	77	84
13 Milwaukee.....	228	227	211	228	140	125	117	97	91	78	80	83
14 Racine.....	242	241	225	242	153	137	129	108	100	81	80	80
15 Kenosha.....	252	251	234	252	163	147	138	117	108	86	87	86
16 Waukegan.....	266	265	249	266	177	160	152	130	122	100	96	93
17 Chicago.....	294	293	276	293	204	186	179	156	146	120	114	106
18 South Chicago.....	302	301	285	302	213	196	188	165	154	127	120	114
19 Indiana Harbor.....	304	303	287	304	215	198	189	167	156	129	122	115
20 Gary.....	309	308	292	309	216	199	191	167	157	129	121	114
21 Michigan City.....	295	294	278	295	206	189	181	157	146	117	108	99
22 St. Joseph.....	269	268	251	268	179	162	154	130	119	88	78	69
23 South Haven.....	251	250	233	250	161	144	136	111	101	69	58	49
24 Saugatuck.....	232	231	215	232	143	126	118	93	83	51	40	29
25 Holland.....	227	226	210	227	137	120	112	88	77	45	34	23
26 Grand Haven.....	206	205	189	206	117	100	92	67	57	25	13	...
27 Muskegon.....	195	194	178	195	106	89	80	56	46	13	...	...
28 White Lake.....	184	183	167	184	95	78	69	45	35	...	...	...
29 Pentwater.....	154	153	137	154	65	48	39	14	...	...	...	...
30 Ludington.....	143	142	126	143	54	37	26	...	...	...	...	...
31 Manistee.....	118	117	100	118	28	10	...	...	...	...	...	...
32 Portage Lake.....	110	109	93	110	20	...	...	...	...	...	...	...
33 Frankfort.....	93	92	75	92	...	...	...	...	...	...	...	...
34 Traverse City.....	69	58	45	...	...	...	...	...	...	...	...	...
35 Charlevoix.....	33	18	...	...	...	...	...	...	...	...	...	...
36 Potoskey.....	37	...	...	...	...	...	...	...	...	...	...	...
37 Beaver Island Harbor.....	0	...	...	...	...	...	...	...	...	...	...	...

¹ From sailing course point north of light.² Distances from Menominee and Green Bay to Lake Michigan points (except those marked *) are via Sturgeon Bay Canal.

* Via Rock Island Passage.

points on Lake Michigan.

25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2
Holland. Saugatuck. South Haven. St. Joseph. Michigan City. Gary. Indiana Harbor. South Chicago. Chicago. Waukegan. Kenosha. Racine. Milwaukee. Port Washington. Sheboygan. Manitowoc. Two Rivers. Keweenaw. Algoma. Sturgeon Bay. Green Bay. Menominee. Escanaba. Manistique.																							
257	263	281	300	325	336	334	333	324	296	282	272	259	237	212	191	187	170	161	155	198	155	129	75
225	232	250	268	294	303	301	298	290	260	244	235	220	195	168	146	142	120	111	108	135	92	68	..
213	220	238	255	280	288	286	283	274	242	226	217	201	176	149	127	122	100	90	69	101	55	..	..
177	183	200	216	239	246	243	240	230	198	184	172	155	130	103	81	75	52	43	22	49	..	..	..
202	209	225	242	264	272	268	265	255	223	209	197	180	155	128	106	101	78	68	47	..	..	..	..
156	162	178	195	217	225	222	218	208	176	162	150	133	108	81	58	54	30	21	..	..	..	..	..
142	148	163	179	200	206	203	200	190	158	142	132	115	89	62	40	36	12	..	..	..	..	..	..
135	141	156	171	192	197	194	191	181	149	133	123	105	79	53	31	26	..	..	..	..	..	..	..
118	123	137	151	170	174	171	168	158	125	109	100	83	55	29	6	..	..	..	..	..	..	..	..
118	123	137	150	169	173	169	166	156	123	107	97	79	53	26	..	..	..	..	..	..	..	..	..
102	106	118	130	146	149	146	143	132	99	83	74	55	29	..	..	..	..	..	..	..	..	..	..
94	97	105	112	124	125	121	118	107	74	58	48	29	..	..	..	..	..	..	..	..	..	..	..
88	89	93	96	104	103	99	96	85	51	35	26	..	..	..	..	..	..	..	..	..	..	..	..
79	80	80	78	84	83	78	75	64	30	14	..	..	..	..	..	..	..	..	..	..	..	..	..
82	82	79	75	76	73	67	64	54	18	..	..	..	..	..	..	..	..	..	..	..	..	..	..
86	84	78	70	64	58	52	49	38	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
95	90	77	60	58	25	19	15	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
100	95	79	60	33	14	8	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
99	95	79	59	31	13	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
99	93	77	55	22	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
82	75	57	36	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
50	44	24	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
29	22	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
8	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..

EXPLANATION.

Explanation generally applicable to all tables is published in Table I.

Points in this table are arranged in geographical sequence proceeding southward along the west shore and returning northward along the east shore.

For determining distances to points in other lakes, distances from all places listed in this table are given to Old Mackinac Point, and this initial point also appears in each of the other tables respectively indicated by numeral designation. The through distance from a given point in this table to a given point in any other table is the sum of the respective distances to each given point from Old Mackinac Point, common to the two tables. Thus, a through distance from a Lake Michigan point to a point in Lake Superior (Table II) would be derived as follows:

Old Mackinac Point to Racine..... 272
Old Mackinac Point to Ashland..... 439

Racine to Ashland..... 711

TABLE IV.—Distances between points on

		36	35	34	33	22	31	30	29	28	27	26	25
Other tables to which initial points Nos. 1-3 are common: II—Lake Superior. III—Lake Michigan. V—Lake Erie, St. Clair, Detroit, and Niagara Rivers. VI—Lake Ontario and St. Lawrence River.		Thessalon.	Algoma Mills.	Gore Bay.	Little Current.	Killarney.	French River.	Key Harbor.	Byng Inlet.	Parry Sound.	Depot Harbor.	Victoria Harbor.	Midland.
1	Port Huron (V-VI) ¹	*237	†237	†249	224	212	223	231	228	246	242	266	265
2	Old Mackinac Point (III) ²	69	*101	*116	*143	*167	*196	*205	*211	235	231	256	255
3	Sault Ste. Marie (II) ³	†48	†88	†106	†131	†155	†184	†193	†201	†242	†238	268	267
4	Detour	‡24	‡58	‡76	†101	†125	†154	†163	†171	201	198	224	222
5	St. Ignace	‡68	*100	*115	*142	*166	*195	*204	*209	234	231	256	254
6	Mackinac Island	‡63	*95	*110	*137	*161	*190	*199	*204	229	226	251	249
7	Cheboygan	‡62	*92	*106	*133	*157	*186	*195	*197	221	217	242	241
8	Rogers	‡63	†74	†87	†114	†138	157	163	164	187	183	208	206
9	Rockport	*79	†79	†92	†119	123	136	143	143	166	162	187	186
10	Alpena	*107	†107	†120	†143	131	145	151	152	174	171	195	193
11	Au Sable	*135	†135	†148	158	146	160	163	166	183	180	204	202
12	East Tawas	*155	†155	†168	175	163	176	180	182	199	196	220	218
13	Bay City	*202	†202	†215	222	210	223	228	229	245	243	267	265
14	Saginaw	*216	†216	†228	235	223	237	242	242	258	256	280	278
15	Harbor Beach	*178	†178	†191	171	159	171	176	176	194	190	214	213
16	Port Sanilac	*207	†207	†219	197	185	196	201	201	219	215	239	238
17	Goderich	†198	†198	204	169	159	172	172	174	192	189	213	211
18	Kincardine	†173	†174	174	141	128	142	149	144	162	158	182	181
19	Southampton	†166	†166	155	122	110	123	130	125	143	140	163	162
20	Warton ⁴	†188	158	142	110	94	88	79	81	74	71	76	74
21	Owen Sound ⁴	†197	167	152	119	103	97	97	89	79	75	71	70
22	Meaford ⁴	†200	169	153	121	105	96	96	86	71	68	55	53
23	Collingwood ⁴	†217	186	171	138	120	108	107	97	80	76	57	55
24	Penetanguishene ⁴	†224	187	172	139	120	106	104	94	72	69	12	10
25	Midland	†225	188	173	140	121	107	105	95	73	70	7	...
26	Victoria Harbor ⁴	†227	190	174	142	122	106	106	97	5	71	...	...
27	Depot Harbor ⁴	193	155	140	107	87	73	71	62	6	...	...	...
28	Parry Sound ⁴	197	159	143	111	91	77	75	65	...	...	...	...
29	Byng Inlet ⁴	155	118	102	70	50	31	27	...	...	...	...	...
30	Key Harbor ⁴	148	110	94	62	42	22	...	...	...	...	...	...
31	French River ⁴	139	101	86	53	33	...	...	...	...	...	...	...
32	Killarney ⁴	110	72	56	24	...	...	...	...	...	...	...	...
33	Little Current	86	48	33	...	...	...	...	...	...	...	...	...
34	Gore Bay	61	27	...	...	...	...	...	...	...	...	...	...
35	Algoma Mills	43	...	...	...	...	...	...	...	...	...	...	...
36	Thessalon	0	...	...	...	...	...	...	...	...	...	...	...

¹ From Fort Gratiot range.² From sailing course point north of light.³ From abreast east end of U. S. center pier, and (except those marked †) via Middle Neebish and Detour; distances downbound through West Neebish are 1 mile less.⁴ Distances to Georgian Bay ports (except those marked *, †, ‡, §) are via the bay entrance from Lake Huron and St. Marys River points and via Little Current from North Channel points.

* Via False Detour and North Channels.

† Via Mississagi Strait and North Channel.

‡ Via Hay Lake, St. Joseph, and North Channels.

§ Via Potagannissing Bay and North Channel.

Lake Huron and St. Marys River.

21	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2
Pontanguishene. Collingwood. Meaford.			Owen Sound. Warton. Southampton.			Kincardine. Goderich. Port Sanilac.			Harbor Beach. Saginaw. Bay City.			East Tawas. Au Sable. Alpena.			Rockport. Rogers. Cheboygan.			Mackinac Island. St. Ignace. Detour.			Sault Ste. Marie. Old Mackinac Point.	
264 257 240			237 227 120			93 64 32			62 174 161			118 116 155			165 193 232			242 246 223			269 247	
254 247 230			227 217 189			192 211 215			186 223 210			163 142 115			83 54 18			7 6 45			90 ...	
266 259 242			239 229 207			213 234 238			208 246 232			185 165 137			107 84 84			84 90 45			.....
221 214 197			194 185 162			168 189 193			164 201 187			140 120 92			61 40 39			39 44 ...			.....
252 246 229			227 217 191			194 214 216			187 224 210			163 143 115			83 55 20			6 ...			.....
248 241 224			221 212 186			189 209 212			184 220 207			159 140 111			79 50 17			.....			.....
240 233 216			213 204 175			178 198 202			173 210 196			149 129 101			69 40 ...			.....			.....
206 199 182			177 169 139			142 161 163			134 171 157			110 90 61			31 ...			.....			.....
185 178 161			158 148 112			113 132 134			106 142 129			82 62 31			.....			.....			.....
192 185 168			165 156 109			107 124 125			97 129 116			69 49 ...			.....			.....			.....
201 189 177			174 165 98			85 93 86			58 83 69			21 ...			.....			.....			.....
217 210 194			190 181 110			94 95 88			60 68 54			.....			.....			.....			.....
264 257 240			237 228 153			136 137 130			102 13 ...			.....			.....			.....			.....
278 271 254			250 241 167			149 161 144			115 ...			.....			.....			.....			.....
212 205 188			185 175 79			56 47 32			.....			.....			.....			.....			.....
237 230 213			210 200 97			70 47 ...			.....			.....			.....			.....			.....
210 207 187			183 174 64			36	
180 176 156			153 144 30			
161 157 137			134 125	
73 53 36			29	
69 46 29			
52 14	
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CHAPTER II.

DETROIT TO LAKE HURON, INCLUDING LAKE ST. CLAIR AND THE ST. CLAIR RIVER.

Plan of volume.—This publication, 108 A, begins at Detroit and continues through the St. Clair Lake and River to Lake Huron. It then describes Lake Huron, Georgian Bay, North Channel, Lake Michigan, and Lake Superior. It connects with H. O. Publication 108 B at Detroit, and the two volumes cover the Great Lakes and the St. Lawrence River to Montreal, thus affording sailing directions from the most westerly point of Lake Superior to Montreal.

Detroit, the chief city of Michigan, the fourth city in the United States, is on the Detroit River, 18 miles from Lake Erie. It extends 11 miles along the Detroit River and the shore of Lake St. Clair. The river, sometimes called "The Dardanelles of the New World," is here the boundary between Canada and the United States.

The city has an area of 52 square miles and is finely situated on ground rising gradually from the river. The population in 1920 was 994,000.

Trade.—Detroit ranks first among the northern border ports in the extent of its foreign trade and is first in the amount of exports. About three-fourths of its trade is with Canada and most of the remainder with England. The principal exports are hog products, manufactures of iron and steel, cotton, corn, lumber, and coal.

Communication.—Detroit's position in the southeastern part of the Lower Michigan Peninsula, gives it a natural command over the trade of that region and at the same time places it in easy reach of the country to the south, while its location on the narrow strait leading from Lake Erie to Lake St. Clair and thence to Lake Huron brings into its trade orbit the immense Lake traffic and the Canada trade.

A number of Canadian railroads make their connections with United States railroads at Detroit. The tunnel under the Detroit River, built by the Michigan Central, has greatly increased the traffic between Canada and the United States at this point.

Manufactures.—Detroit is the leading city in the manufacture of automobiles, but is also noted for the variety and extent of its other products, among the leading being stoves, freight cars, adding machines, oils, paints, and varnishes.

Harbor.—The water front of Detroit extends along practically the entire upper 13 miles of the river from Lake St. Clair to the head of Fighting Island, including the American Channel at Belle Isle. There are shelving beaches with shallow water inside of the harbor line at and above Belle Isle, but the bank of the undivided river section below the island is well built out to deep water and occupied by numerous industries and docks, the latter having ample accommodations for the varying classes of vessels which use them. A small shoal off the foot of First Street, with about 17 feet of water over it, is marked by a red and black spar buoy.

The Rouge River constitutes a branch channel of the harbor of Detroit, and the related industrial district also extends down the west channel of the lower Detroit River to Ecorse, Wyandotte, and Trenton.

Three railroad companies have car-ferry transfers plying between Detroit and Windsor. There are also two passenger ferry lines, one running from the foot of Joseph Campau Avenue to Walkerville, the other running from the foot of Woodward Avenue to Windsor. The Michigan Central Railroad tunnel under the Detroit River crosses from the vicinity of Twelfth Street, Detroit, to Windsor.

A marine post office is maintained at Detroit during the season of navigation, operating a special mail boat, which delivers and receives mail to and from boats while passing through the river.

Storm warnings.—Day and night signals are displayed from a flagstaff and a steel tower on the roof of the Majestic Building in Detroit, about 2,000 feet north of the river at the foot of Woodward Avenue. Printed cards of weather predictions are delivered by the mail boat to passing vessels.

A radio station is operated all the year by the United States Navy; call letters NRQ; working distance, 150 miles.

Dry docks.—The Detroit Shipbuilding Co.'s dry dock, at the foot of Orleans Street, has a length of 341 feet on blocks (370 feet over all), width of 59 feet at the bottom and 90 feet at the top, with 16 feet depth over sill.

The marine railway of the Imperial Shipbuilding Corporation at the foot of Dubois Street is 160 feet long and 36 feet wide, with 12 feet depth aft and 6 feet forward.

The shipyard of the Great Lakes Engineering Works fronts on the main channel about midway between Rouge River and Ecorse. The floating dry dock of this concern has a length of 790 feet (on blocks and over all), width of 86½ feet at the bottom and 95½ feet at the top, and depth on the sill of 18 feet.

Ojibway, Ontario.—The Canadian Steel Corporation, which has a tract of 2,500 acres of land with a frontage of nearly 2 miles on the Detroit River opposite and below the Rouge River and above

Fighting Island, in December, 1916, began construction of a slip upon which will be erected large docks for unloading iron ore. The slip will be 2,100 feet long, with a width of 400 feet on the harbor line and of 200 feet between the dock fenders, and will be dredged to a depth of about 23 feet.

Sandwich, Ontario, the judicial seat of Essex County, is located opposite Fort Wayne in Detroit, and just below Windsor. It has about $1\frac{1}{2}$ miles of river frontage, generally with shallow water between the edge of the channel and the shore, a width of about 250 yards. There is little commerce. Coaling stations of the Pittsburgh Coal Co. and the Mullen Coal Co. are located here and have good docks and good water. The other wharves are old and dilapidated. Electric cars run from Sandwich to Windsor and Walkerville, and to Amherstburg.

Windsor, Ontario.—A city opposite Detroit, and a port of entry, with customhouse. A stopping place for Canada passenger steamers passing through Detroit River. It has 2 miles of river front lined with docks and railway transfer slips, all of which have from 3 to 4 fathoms of water. There is a Government warehouse of concrete, and a landing dock 650 feet long, of piling and concrete. The Grand Trunk Railroad, Canadian Pacific Railroad, and the Pere Marquette Railroad transfer their freight on car ferries to and from Detroit.

A small bowlder shoal with 15 feet least water on it lies 665 yards below the Michigan Central car-ferry wharf, 200 feet offshore and nearly opposite the old distillery wharf at that place. The outer portion of this shoal, with 18 feet depth, is situated 450 feet north-east of the shallow spot and about 400 feet from shore.

Walkerville, Ontario, is a flourishing manufacturing town opposite Detroit and on the east of Windsor. It is connected with Windsor by electric cars and with Detroit by a steam ferry to the foot of Joseph Campau Avenue. It is on the Grand Trunk Railroad, and a terminal station of the Pere Marquette Railway. Walker's distillery and grain elevators are conspicuous landmarks; there is 20 to 24 feet of water at the distillery dock. Electric lights displayed at night form a good aid to navigation for the traffic passing through the main or Canadian channel past Belle Isle.

Ford City, Ontario, situated just above Walkerville, is the site of the Canadian plant of the Ford Motor Co. (Ltd.), and has good docks with ore-unloading devices.

DETROIT RIVER—GENERAL DESCRIPTION.

Physical conditions and current.—The Detroit River issues from Lake St. Clair and has a length of about 31 miles from its head at Windmill Point Light to Detroit River Light at its mouth in Lake

Erie. It is divided into two parts, northerly or upper and southerly or lower, the line of division being the northern end of Fighting Island. The upper part from the customhouse at Detroit is described in this chapter and the remainder in H. O. 108B.

For the northerly or upper 13 miles, or to the head of Fighting Island, the river is uninterrupted except directly at its head, where it is divided by Peach Island and Belle Isle; in the upper river the water is generally deep, the bottom is of earth, the channel banks are quite steep, and the current velocity is about $1\frac{1}{2}$ miles per hour.

The southerly or lower river broadens out and is characterized by many islands and shallow expanses; in this portion the banks are more sloping than in the upper river, and the bottom consists generally of earth and bowlders with the exception of about 6 miles north of the south end of Bois Blanc Island, where the bottom is mainly bedrock and bowlders. At Limekiln Crossing, in this rock section, the mean current velocity is about 3 miles and the maximum velocity about 6 miles per hour. The limitations imposed by the natural formation of the lower river bed have necessitated very extensive rock excavation and dredging to provide channels of suitable width and depth for the large vessels engaged in lake commerce.

Channel conditions.—From Lake St. Clair to the head of Fighting Island, a distance by steamer track of about 13 miles, the channel is 800 or more feet in width, with a minimum depth of 24 feet, the point of least width being between the shoals at the foot of Peach Island and at the head of Belle Isle. From the head of Fighting Island to the head of Ballards Reef, a distance of about 7 miles, there is a minimum depth of 22 feet and a least width of 800 feet. From Ballards Reef to deep water in Lake Erie two channels are provided, the Livingstone (downbound) Channel being 22 feet deep and at least 300 feet wide, and the Amherstburg (upbound) Channel being 21 feet deep and at least 600 feet wide.

Details of the various river channels are given in the "Local descriptions" following. The channels are marked by numerous lights and buoys. (See the light and buoy lists published by United States Bureau of Lighthouses.)

Fluctuations of water surface.—Each year the river rises and falls about 2 feet as measured by the monthly mean levels. In the past 59 years the difference between the highest and the lowest monthly mean levels has been about 4 feet. During the season of 1918, the lowest mean depth for any month in the navigable channels of the river was 22.3 feet, this being in the Amherstburg Channel of the lower river. However, occasional fluctuations in depth of several feet, produced by high easterly or westerly winds, respectively, raise or lower the water level at the west end of Lake Erie and similarly

affect the level of the lower Detroit River; such changes have been as much as 6 feet within eight hours.

FROM DETROIT TO HEAD OF THE RIVER.

From the customhouse at Detroit the river has a 68° (ENE. $\frac{1}{2}$ E.) direction, gradually widens, and about $2\frac{1}{2}$ miles above the customhouse is divided, by Belle Isle, into two channels, the American and Canadian.

Above Belle Isle the channels unite, the river narrows slightly, and forms one channel for about 1 mile, when it again divides into two parts by Peach Island. The main channel is north of Peach Island. The south of Peach Island is narrow, crooked, shoal in spots, and is unmarked by buoys or lights.

Belle Isle is rectangular in shape, 2 miles long north-northeast and south-southwest and 880 to 1,500 yards wide. Its southern shore is comparatively free from shoals. A shoal extends 1,500 yards from its southwestern end.

Buoy.—A red and black horizontally striped buoy marks the end of this shoal. A shoal extends about 1,300 yards from the northeastern end of the island.

Belle Isle East End Light Buoy, showing an occulting white light, is moored in 28 feet at the junction of the Canadian and American channels near the end of the shoal extending from the northeastern end of the island.

Shoals also extend from the northern side of the island. Between them and Scott Middle Ground is a narrow passage of deep water.

The island is an amusement park. A bridge connects it with the city of Detroit.

Belle Isle Light, fixed red, 42 feet above water, visible 10 miles, is shown from a red, square, brick tower with a dwelling attached, on the southeast point of the island.

Canadian Channel passes southward of Belle Isle, is wide and deep, and is the main channel used for through navigation.

Shoal.—A detached shoal with a least depth of 18 feet lies nearly in mid-channel north of Walkersville at the western entrance of the channel.

The Canadian shore from Ford City trends nearly due east for about 2 miles, being slightly wavy and irregular. From that point it trends almost due north for about 1,320 yards, then eastward and southeastward until it joins the shore of Lake St. Clair. This shore throughout is bordered by shoal water, which extends from about 200 feet to 800 yards from shore, the greatest extension being in the light opposite Belle Isle Light.

American Channel.—This channel passes north of Belle Isle, is crooked, and is little used except for local and pleasure traffic.

Scott Middle Ground.—A very shallow middle ground exists between the island and the main shore; the channel north of this middle ground has a width of 600 feet with a depth of 18 feet or more.

Buoys.—Three red spar buoys mark the channel limits along the edge of the middle ground.

Bridge.—The highway bridge across the American Channel, connecting Detroit with Belle Isle, which is a city park, was destroyed in 1915. The city has provided a temporary wooden trestle bridge about 175 feet below the site of the burned bridge. This temporary bridge has a draw span near the main shore, with clear width of 75 feet in each opening.

Signal for opening draw, three blasts of the whistle or horn (— — —).

Note.—The chart shows three fixed red lights on this bridge; detailed description not given.

Waterworks intake crib.—Detroit waterworks intake crib is about 250 yards eastward of the dock on the northeastern point of Belle Isle.

Light, a group flashing white light, 40 feet above water, is shown from a white tower on the Detroit waterworks intake crib.

The American shore of the Detroit River from the customhouse, city of Detroit, trends northeastward to Windmill Point and is fronted throughout by docks and slips above Belle Isle Bridge, shoal water extends from 150 to 500 yards from the shore.

Windmill Point is on the northern side of the Detroit River at its entrance into Lake St. Clair.

Windmill Point Light, an alternating fixed white and flashing red light 55 feet above water, visible white 14 miles, red 11 miles, is shown from a white conical tower, on the north point of the shore. (See Light List.)

Range Lights—Front Light.—A fixed red light, 57 feet above water is shown from a white conical tower, on the north point of the shore.

Rear Light.—A fixed red light, 77 feet above water, is shown from a white conical tower 105 yards 45° (NE. $\frac{1}{2}$ E.) from the front light.

These lights in range lead through the passage between Peach Island and Belle Isle.

Peach Island, 1 mile long east and west and 700 yards wide at its western end, is somewhat gourd shaped, the eastern end being the smaller. It lies in the entrance to the river, about 1,320 yards south of Windmill Point and is surrounded by shoal water.

Directions—Main Channel.—From abreast the customhouse at Detroit a vessel should keep in midchannel and steer 70° (ENE $\frac{3}{4}$ E.) until abreast the buoy, moored at the extremity of the spit extending from the southwestern end of Belle Isle, leaving it on the port hand and taking care to avoid the detached 18 foot spot which lies in midchannel south of the buoy. Then steer 80° (E. $\frac{3}{4}$ N.) for $1\frac{1}{2}$ miles, when change to 72° (ENE $\frac{3}{4}$ E.) and continue in midchannel until Belle Isle Light bears 297° (NW. by W. $\frac{3}{4}$ W.) when Windmill Point Range Lights should be in range bearing 45° (NE. $\frac{1}{4}$ E.). Continue on this range which leads through the Channel between Belle Isle and Peach Island until Waterworks Intake Crib Light bears 270° (W. $\frac{1}{4}$ N.) then steer 67° (ENE. $\frac{1}{4}$ E.) for about 2 miles, which will lead to the southwestern entrance of Grosse Point Channel, the directions for which are given later.

Directions for American Channel.—In using the American Channel, leave the buoy at the extremity of the spit extending from the southwestern end of Belle Isle on the starboard hand, keeping in midchannel or nearer the American shore, pass through bridge draw and to the northward of Scott Middle Ground Buoys, and when upper buoy No. 6 is reached haul up for Windmill Point Lighthouse until the waterworks intake crib bears 180° (S. $\frac{1}{4}$ W.) then steer 94° (E $\frac{1}{4}$ S.) until the Windmill Point range line is reached, then follow directions as before given for main channel.

LAKE ST. CLAIR.

The depths herein given are referred to low-water datum, the reference plane for United States river and harbor improvements, which for Lake St. Clair is an elevation 573.8 feet above mean sea level. Depths on the Lake Survey chart of St. Clair River (index No. 43), referred to standard low water are generally one-half foot less than those herein published; depths on chart of Lake St. Clair (index No. 42), referred to elevation 575.11, are 1 to $1\frac{1}{2}$ feet more.

DIMENSIONS, SURFACE ELEVATIONS, ETC.

Length, steamer track, lighthouse at southwest end of St. Clair Flats			
Canal to Windmill Point Lighthouse	-----miles-----		17
Length (right line), on about longitude $82^{\circ} 45'$	-----miles-----		26
Breadth (right line), on about latitude $42^{\circ} 25'$	-----miles-----		24
Areas in square miles:	United States. Canada.		Total.
Water surface of lake, including St. Clair			
River	180	280	460
Entire drainage basin, including St. Clair			
River	2, 310	4, 110	6, 420
Rainfall, average annual	-----inches--		34
High water of 1838, above mean sea level	-----feet--		577. 86
Standard low water (adopted for charts), above mean sea level	-----feet--		573. 30

Mean surface, 60 years, 1860-1919, above mean sea level.....	feet..	575. 64
Mean surface below mean surface of Lake Huron.....	feet..	5. 52
Mean surface above mean surface of Lake Erie.....	feet..	3. 11
Season of navigation, average dates:	Opening.	Closing.
St. Clair River	Mar. 31	Dec. 19
Detroit River	Mar. 30	Dec. 18

The following list gives the monthly mean stages of the lake, above mean sea level, during the year 1919, as recorded by U. S. Lake Survey automatic water gauge at St. Clair Flats Canal upper entrance:

	Feet.		Feet.
January	575. 91	August	575. 94
February	575. 15	September	575. 67
March	575. 38	October	575. 43
April	575. 82	November	575. 18
May	576. 26	December	574. 70
June	576. 29		
July	576. 19	Yearly mean.....	575. 66

Lake St. Clair.—A shallow body of water which connects the Detroit River with the St. Clair River. It is 26 miles long and 24 miles wide at its widest part; its greatest depths are in an irregular area in the central part of the lake, being $3\frac{1}{2}$ fathoms. Irregular depths of 2 to 18 feet extend out from the shore all around the lake at distances varying from 1 to 7 miles, and local knowledge is required in approaching the shore, which may be done only with light-draft vessels.

American shore.—The American shore of Lake St. Clair trends in a northerly direction from Windmill Point to Point Huron and is fronted by shoal water which extends from 400 yards to 4 miles from shore. It is also bordered by towns, villages, and settlements throughout its length.

Grosse Pointe Farms, Mich., is an incorporated village, suburban to Detroit, situated on the westerly lake shore abreast of the ship channel and 3 miles northeast of Windmill Point at the head of the Detroit River. A number of piers with 6 to 10 feet of water extend 200 to 400 yards into the lake.

Intake Crib Light.—A fixed red light, 10 feet above water is shown from a mast, to mark the submerged water intake crib about 1,065 yards yards 120° (SE. by E. $\frac{1}{4}$ E.) from the waterworks tower.

Grosse Pointe Dumping Ground, $1\frac{1}{2}$ miles off the Clubhouse Dock and about 2,400 feet southeasterly from the ship channel, runs 67° (ENE. $\frac{1}{4}$ E.) direction $1\frac{1}{2}$ miles, with a width of three-fourths mile and a least depth of 6 feet, and should be avoided.

Clinton River, Mich.—This is a narrow and crooked stream discharging into the west side of Anchor Bay about 2 miles north of Point Huron. The river had an original depth of 10 feet, with several shoals affording but 5 to 6 feet, and a bar at the mouth having a navigable depth of only 3 to 4 feet.

Improvements.—The improvements provide an 8-foot channel from the mouth to the city of Mount Clemens, a pile dike across the flat at the mouth, revetments as needed above, and a straight cut through Shoemakers Bend. Dredging is necessary to maintain this depth.

Piers and revetments.—There is a pile dike 890 feet long at the mouth of the river on the north bank of a channel dredged across the outer bar, its line running east and west. At its outer end in 10 feet of water a pile crib filled with brush and stone, 40 feet square, was built about 767 yards east of the river mouth. An interval of 400 yards between the west end of the dike and the mouth of the river is partially occupied by a brush mattress. On the north bank near the mouth, a large timber lighthouse crib is connected with the shore by a pile revetment 330 feet long. The mast of the rear range light stands on the ruins of this crib. In the upper river there is a pile revetment at Shoemakers Bend, about 1 mile below Mount Clemens, as a protection to the left bank of the river, and another one near the city limits along the right bank.

These various pile and brush structures are in a dilapidated state, large portions of them having entirely disappeared.

Channel.—A channel 8 feet deep and from 80 to 100 feet wide was secured from the river mouth to Macomb Street Bridge in Mount Clemens, a distance of 8 miles. The present available draft is about 6 feet.

The river is navigable by small boats, launches, and flatboats a considerable distance upstream from Mount Clemens.

Fluctuations of water surface.—Each year the level of the Clinton River rises and falls from 6 to 9 feet at Tuckers Dock, Mount Clemens, due to the fact that the spring freshets raise the level considerably above the normal. From day to day the level changes somewhat, due to wind, such changes occasionally amounting to over a foot.

Range lights.—A range of white lights leads into the mouth of the river. The front light flashing white, 12 feet above water, visible 7 miles, is shown from a white house on piles in 7 feet of water on north side of river entrance. The rear light, occulting white, 30 feet above water, visible 7 miles, is shown from a white mast rising from the southeast corner of the old lighthouse crib, 733 yards 270° (W. $\frac{1}{4}$ N.) from the front light.

Bridges across Clinton River at Mount Clemens.

No.	Location and name.	Kind.	Distance above mouth.	Draw openings—clear width.		Clear head-room.	Condition of draws for passage.
				Right. ¹	Left. ¹		
1	Market Street.....	Highway....	Miles. 7.20	Feet. 32	Feet. 32	Feet. 16.6	Right clear; left obstructed.
2	Macomb Street.....	do ¹	7.33	47	47	19.9	Both clear.

¹ Looking downstream.² Bridge carries street railway tracks.

Signals for opening draws.—Market Street, 3 blasts (— — —); Macomb Street, 4 blasts (— — — —).

Bridges are lighted according to U. S. Lighthouse Bureau regulations for lighting bridges.

A pile, showing about 6 feet above water, is located about 200 yards from the channel entrance of the Clinton River midway between the front and rear range lights.

Anchor Bay, Mich., is the shallow northwest arm of Lake St. Clair, receiving the outflow of the North Channel of the St. Clair River. It has maximum depths of 12 to 13 feet in its central portion, shelving gradually to the shore line, and is separated from the main lake by a bank across which only 8 or 9 feet can be carried. The best water across this bank is on a north and south line passing close to eastward of Point Huron black light buoy, showing flashing white light, moored in 13½ feet of water 2½ miles and southeasterly from Point Huron.

New Baltimore is a village, with several industries, on the northerly shore of Anchor Bay, and on the electric Rapid Railway system from Detroit. The docks on the bay front have only about 8 feet of water.

Anchor Bay can be approached through the North Channel, but it has a bar of 8 feet least water at its mouth. This channel passes to the northward of Herson and Dickinson Islands, past the Chenal Aboutronnd to Pointe aux Trembles; thence northwestward for 1½ miles; thence westerly to its mouth in Anchor Bay. There is deep water in mid-channel up to the point 1½ miles northwestward of Pointe aux Trembles, whence the depth gradually decreases from 21 feet at that point to the bar at its mouth, upon which is only 8 feet. This channel is not buoyed.

The Chenal Aboutronnd, to the west of Dickinson Island, and the Middle Channel, between Dickinson and Herson Islands, carry deep water for the greater part of their lengths, but their entrances from the lake are barred by shallow water of from 3 to 4 feet in depth. Neither channel is buoyed.

The other channels to the eastward of Herson Island, viz, Bassett Channel, Blind Channel, Johnston Channel, and the Chenal Ecarté are equally impracticable on account of these bars from the lake.

The South Channel, leading to the canal, and the Old Channel, or cut, are the only ones that can be used leading from the river into the lake, and vice versa.

Connection with the head of the Detroit River to deep water in the lake is made by a 20-foot dredged channel and with the St. Clair River by the St. Clair Flats Canal.

The **Canadian shore** of Lake St. Clair, from a point south of Peach Island, trends in a 106° (ESE. $\frac{1}{2}$ E.) direction, to Belle River and is slightly concaved. The 18 foot (3-fathom curve), which is very regular, lies at distance varying from $4\frac{1}{2}$ to $6\frac{1}{2}$ miles from this shore. The Grand Trunk Railroad follows along this shore.

Pike Creek is a small stream which empties into the lake $4\frac{1}{2}$ miles from Peach Island. The town lies westward of the creek.

CANADIAN SHORE OF LAKE ST. CLAIR.

River Aux Puces, a small stream, empties into the lake $3\frac{1}{2}$ miles east of Pike Creek.

Puce, a town near its mouth is a station on the Grand Trunk Railroad.

Belle River, Ontario, is a village on the south shore of Lake St. Clair and on the Grand Trunk Railway about 17 miles from Windsor. The channel at the entrance to the harbor was dredged in 1912 to a depth of 10 feet; in its exposed position it is subject to fill.

Range day beacons lead in through the dredged channel in Lake St. Clair to the mouth of the river. Each beacon consists of a diamond-shaped slatwork day mark, white with a black vertical stripe, attached to a black pole. The front beacon is on the east side of the river mouth, 156 feet southward from the outer end of the sheet piling. The back beacon is 125 yards 175° (S. $\frac{1}{2}$ E.) from the front beacon.

The shore from Belle River, Ontario, trends eastward to Thames River; it is straight except for a large, gradual curve at Stony Point. The 18-foot (3-fathom) curve, which is quite irregular, extends from $3\frac{1}{2}$ to 7 miles off shore.

Buscom River, $4\frac{1}{2}$ miles east of Belle River, is shallow and unsuited to navigation.

Thames River, Ontario. This river empties into the southeasterly end of Lake St. Clair, and is reached through a dredged channel approximately 8,100 feet long, 100 feet wide, and 13 feet deep, which is maintained across the shallows in the lake. Owing to its exposed position and its bed of fine sand, the channel is subject to considerable filling, and requires annual dredging.

There is a wharf on the south side of the river mouth,

Thames River Range Lights—Front Light.—A fixed white light 22 feet above water, visible 9 miles, is shown from a red, square skeleton tower 100 yards 320° (NW. $\frac{1}{2}$ N.) from the rear light.

Rear Light.—A fixed white light, 55 feet above water, visible 12 miles, is exhibited from a white circular tower, with a red polygonal lantern located on the south shore at the mouth of the river.

These in range bearing 140° (SE. $\frac{1}{2}$ S.) lead through the dredged channel to the river mouth.

Light buoy.—A light buoy, exhibiting an occulting white light, is moored in 14 feet on the north side of the outer end of the dredged channel $1\frac{1}{2}$ miles 320° (NW. $\frac{1}{2}$ N.) from the rear range light.

The city of Chatham is situated about $19\frac{1}{2}$ miles upstream from the river mouth, and a channel affording about 12 feet draft has been provided by dredging through bars and widening the channel at bends in the river, and removing snags and sunken obstructions.

The shore from the Thames River trends easterly and northerly to Mitchell Point. It is quite irregular, ragged, and has a few off-lying islands.

Mitchell Point, somewhat rectangular in shape, forms the southern extremity of Mitchell Bay.

Mitchell Bay, Ontario, is in the northeasterly corner of Lake St. Clair. There is a wharf, with a dredged channel 50 feet wide and about $5\frac{1}{2}$ feet deep extending southwesterly from it about 613 yards.

Range Lights—Front Light.—A fixed white light, 21 feet above water, visible 9 miles, is shown from a white mast with a shed alongside, on the inner end of the wharf.

Rear Light.—A fixed white light, 30 feet above water, visible 9 miles, is shown from a white mast, 72 yards 45° (NE. $\frac{1}{2}$ E.) from the front light. These in range lead up to the wharf.

Dredged channel.—There is a dredged channel in Mitchell Bay leading to Chenal Ecarte, passing east of Martin Island, which lies south of St. Anne Island.

Range Lights—Front Light.—A fixed white light, 28 feet above water, visible 9 miles, is shown from a pole with a white diamond-shaped day mark, on the east end of Martin Island.

Rear Light.—A fixed white light, 36 feet above water, visible 9 miles, is shown from a similar structure as front light 90 yards 3° (N. $\frac{1}{2}$ E.) from the front light. These in range lead through the dredged channel into Chenal Ecarte.

The shore from Mitchell Bay to the St. Clair Flats Canal trends westward and is very irregular having numerous projections and indentations. The St. Clair River empties, through its various mouths, into the lake along this part of the shore.

CHANNELS IN LAKE ST. CLAIR.

Grosse Pointe Channel.—The ship channel dredged through the shoal at the foot of Lake St. Clair and leading to the deep water at the head of the Detroit River, is a straight cut a little over $5\frac{1}{2}$ miles long, 367 yards wide, and 21 feet deep. The natural depths on the shoal outside of the 800-foot channel are generally from 12 to 15 feet.

Peach Island Range Lights—Front Light.—An occulting white light, 38 feet above water, visible 13 miles, is shown from a black conical tower on a rectangular crib in 20 feet of water at the southwestern end of the lake.

Bear Light.—A fixed red light, 58 feet above water, visible 14 miles, is exhibited from a black conical tower on a square crib 1,180 yards 228° (SW. $\frac{3}{4}$ W.) from the front light.

These lights in range lead through Grosse Pointe Channel.

Light buoys.—The channel is marked by six light buoys, three on each side, each showing an occulting red light. (For details see Light List.)

Buoys.—The channel is also buoyed by black spar buoys on the northwestern side and red spar buoys on the southeastern side.

Lake St. Clair Light Vessel shows a fixed white light, 25 feet above water, visible 12 miles. It has a red hull, one mast painted black, circular day mark "St. Clair" on both sides. It is moored on the southeast side of the upper end of the channel.

A fog signal is made on a bell.

Channel at middle of the lake:—About halfway across the lake and at the intersection of the St. Clair Flats Canal and the Peach Island ranges, the 20-foot channel has a width of about 334 yards, but there are shoals with 16 feet depth on either side. Those along the easterly side of the channel, in the vicinity of the midlake turning point, have in the past been the occasion of grounding of deep-draft vessels when slightly eastward of the proper course.

Light and bell buoy.—A red conical buoy surmounted by a skeleton superstructure and showing an occulting red light is moored in 20 feet of water on the east side of the channel. A bell is sounded by the action of the waves.

St. Clair Flats Canal, Mich.—Originally the several principal channels of the St. Clair River Delta afforded good water, but all were obstructed at their entrances by marly and sandy deposits forming bars in Lake St. Clair, on which the depths were from 2 to 6 feet. The natural outlet of the South Pass or Channel is the shortest route for through navigation.

St. Clair Flats Canal consists of the two channels extending from the mouth of the South Channel into Lake St. Clair, a distance of

3½ miles. For a distance of about 1.2 miles at the upper end the two channels are separated by a sand dike 100 feet wide, revetted on each side by sheet piling, and the old or east channel is inclosed on its east side by a similar dike 50 feet wide. The old east channel is about 350 feet wide between the dikes and the west channel is 300 feet wide. Below the dikes the two channels are combined, with a uniform width of 750 feet. The depth of the channel, as restored by dredging and verified by an examination made in June, 1918, is 20 feet.

St. Clair Flats Canal Lower Light, fixed red, 45 feet above water, visible 14 miles, is shown from a red, octagonal tower on dwelling on the southern end of the West Pier.

St. Clair Flats Canal Upper Light, fixed red, 45 feet above water, visible 10 miles, is shown from a red, octagonal tower, on a dwelling on the north end of the West Pier.

The Old Channel, at its outer end, is 1½ miles northwesterly from the canal, and its upper end connects with the South Channel just above the dikes. From the 12-foot curve in Lake St. Clair to its connection with the main channel, it has a length of 2½ miles, with a depth, over a narrow and irregular width, of not more than 11 feet. It provides passage for small vessels, yachts, and other craft of light draft, which can thus avoid passing through the canal channels used by the numerous large vessels.

Light buoys.—A light buoy, No. 21, showing an occulting white light, is moored in 20 feet of water on the west side of the lower entrance.

A light buoy, No. 22, showing an occulting red light, is moored in 20 feet of water on the west side of the lower entrance.

A light buoy, No. 3, showing an occulting white light, is moored in 20 feet of water at the lower end of the West Channel, St. Clair Flats Canal.

A light buoy, No. 9, showing a flashing white light, is moored in 20 feet of water at the upper end of West Channel, St. Clair Flats Canal.

A light buoy, No. 4, showing an occulting red light, is moored in 22 feet of water at the lower entrance of East Channel, St. Clair Flat Canal.

For lights and buoys in Old Channel see Light List.

Shoal—Light buoy.—There is some shoaling, in Lake St. Clair, in prolongation of the dike separating the two channels of the St. Clair Flats Canal.

A buoy painted in red and black horizontal stripes and showing an occulting red light, is moored about 600 yards from the southerly end of the middle dike to mark the lower end of this shoal.

A red spar buoy also marks this shoal.

A red spar buoy marks the upper end of a shoal extending northward from the upper end of the center dike.

Directions.—With the Peach Island Range Lights in range, astern, bearing 228° (SW. $\frac{3}{4}$ W.) steer 48° (NE. $\frac{3}{4}$ E.) through Grosse Pointe Channel, and in Lake St. Clair passing Lake St. Clair Lightvessel on the starboard hand, a distance of about 10 miles, until abreast the light buoy moored on the southeastern side of channel at the middle of Lake St. Clair. Then steer 41° (NE. $\frac{1}{4}$ N.) for the lower entrance of St. Clair Flats Canal. (See track on chart.) Passage through the St. Clair Flats Canal will be controlled by the custodian thereof or his assistants.

Rules and regulations prescribed by the Secretary of War for the government of St. Clair Flats Ship Canal:

Definition: St. Clair Flats Ship Canal comprises the dikes, the water between the dikes and for a width of 300 feet west of the west dike, and the improved channels of approach both above and below the dikes.

(Paragraphs 1 and 2 relate to administration.)

3. The custodian of the canal, either by himself or through assistants, shall direct the movements of all vessels, boats, and other floating things in the canal. The directions, orders, and instructions given by him or his assistants in directing the movement of any vessel, boat, or other floating thing in the canal shall be obeyed by all persons in charge of or employed upon said vessel, boat, or other floating thing, and by each and every person upon the dikes.

4. All persons in charge of or employed upon vessels or boats are forbidden to pass through the left-hand channel or to cause or permit their respective vessels—

To land or tie up to the banks unless on Government business.

To enter the canal two or more abreast.

To pass another vessel or boat while going in the same direction in the canal while within 1,000 feet of the dikes.

To follow another vessel or boat at a distance of less than 500 feet, except when in tow.

To obstruct the canal in any way.

5. No one in charge of or employed on a sailing vessel shall cause or permit such vessel to beat through the canal.

6. All persons are prohibited from willfully or carelessly injuring or damaging the revetment work of the dikes, or the trees growing on the dikes, or any of the Government buildings or other public property pertaining to the canal or the dikes, or any part thereof.

Old Cut Channel.—The old cut through the St. Clair Flats to abreast the upper light of the St. Clair Flat Canal is about $2\frac{1}{2}$ miles long and about 180 feet wide at its narrowest part. It is now used

by small craft under sail and tugs towing rafts, as only 12 feet can be carried through it.

St. Clair Flats Range Lights—Front Light.—A flashing white light, 28 feet above water, visible 7 miles, is shown from a yellow tower on a crib at the head of the Old Channel.

Rear Light.—An occulting white light, 44 feet above water, visible 7 miles, is shown from a yellow conical tower on a crib about 335 yards 56° (NE. by E.) from the front light. These in range lead through the lower reach of Old Cut Channel.

Directions.—To enter St. Clair River through Old Channel, St. Clair Flats, steer 33° 45' (NE. $\frac{3}{4}$ N.) from Lake St. Clair Light-vessel for 8½ miles, bringing the St. Clair Range Lights in range bearing 56° (NE. by E. $\frac{1}{4}$ E.), which course will lead through the center of the channel, the northwestern side of which is marked by a black spar buoy (No. 1). Keep on the St. Clair Flats Range with red spar buoys (Nos. 2, 4, and 6) on the starboard hand until within 400 yards of the front range light, then haul gradually to 113° (SE. by E. $\frac{1}{4}$ E.), bringing the front lighthouse of the St. Clair Range to bear astern, steering a little to the southward of the Upper Canal Light or keeping that light a little open on the port bow. When midway between black spar buoys (Nos. 3 and 5), on the port hand, haul gradually northward, heading for the middle of the south channel of the St. Clair River.

ST. CLAIR RIVER.

The depths herein given are referred to the sloping surface of the river corresponding to a Lake Huron stage of 579.6 feet and a Lake St. Clair stage of 573.8 feet above mean sea level, which elevations are the project planes of low-water datum for the two lakes. Depths on the Lake Survey chart of St. Clair River, referred to standard low water, are from $\frac{1}{2}$ to 1 foot less than those herein published.

General description.—The St. Clair River has two characteristic sections—the upper or normal channel, and the lower or delta portion. The upper channel runs from Lake Huron to the head of Chenal Ecarte, a distance by steamer track of about 27 miles. There are two islands in the upper portion of the river—Stag Island and Woodtick Island; there are good channels on both sides of these islands.

At Chenal Ecarte the river begins to divide into a number of distributaries, forming the delta portion commonly known as the St. Clair Flats. The most important branch, used for through navigation, is the South Channel, and it connects with the improved channel of Lake St. Clair through the St. Clair Flats Canal.

The distance via the South Channel from the head of Chenal Ecarte to the southwest end of St. Clair Flats Canal is about 13 miles, making the total length of the steamboat track from Lake Huron to Lake St. Clair about 40 miles.

The channels and critical points of the river are well marked by numerous lights and buoys, as described in the printed lists issued by the United States Bureau of Lighthouses.

Charts.—Details of the whole river are shown on the chart of St. Clair River, with enlarged insets of St. Clair, of Marine City, and of Russell Island, Algonac, and Grande Pointe; the delta portion is also covered by the chart of Lake St. Clair.

Current velocity.—The river leaves Lake Huron with a velocity opposite Fort Gratiot Light of about 5 miles per hour and enters Lake St. Clair with a velocity through the canal of about $1\frac{1}{4}$ miles per hour; at intermediate points the velocity varies irregularly between these limits. The banks of the river are clay and sand and usually quite steep; there are no rocks.

River discharge.—The discharge through the upper or normal portion of the river is 206,000 cubic feet per second when Lake Huron is at a stage of 581.16 feet above mean sea level (the mean surface level for the years 1860–1919). The increase of discharge per foot rise of the lake is approximately 22,800 cubic feet per second.

St. Clair River—Lower (delta) part.—The lower part of the river commences at Russell Island; it breaks up into several branches which flow through the St. Clair Flats into Lake St. Clair.

South Channel.—This channel is the main route of through navigation, and pursues a somewhat sinuous course which, for about $6\frac{1}{4}$ miles from its head abreast of Russell Island Shoal Light Buoy, has a general southwesterly trend, then curving westerly and somewhat northerly for $2\frac{1}{2}$ miles through the so-called Southeast Bend at the southerly end of Harsens Island, and again assuming a southwesterly direction for about $2\frac{1}{2}$ miles to the head of the St. Clair Flats Canal, subsequently described under the head of Lake St. Clair. This winding channel has good available depths and is marked by a number of range and passing lights maintained by the United States along its northerly side, and by passing lights maintained by the Canadian Government on its southerly side. The American shore line is characterized by the many summer cottages and clubhouses, with landings for excursion and summer-resort traffic.

Shoals.—Two isolated shoals, each having 17 feet over them, lie near the southern side of the channel 350 yards 228° (SW. $\frac{1}{2}$ W.) and 250 yards 190° (S. by W. $\frac{1}{4}$ W.), respectively, from Lower Reach Lower Light No. 1.

An isolated shoal with 18 feet over it lies near the northern shore of Southeast Bend about midway between Southeast Bend Middle Light No. 5 and Southeast Bend Upper Light No. 6.

A shoal extends 100 to 400 yards from the western sides of Squirrel and Walpole Islands from Southeast Bend to Chenal Ecarte.

Two isolated shoals, with depths of 16 and 17 feet, lie near the eastern shore of the channel 400 yards 167° (S. $\frac{1}{4}$ E.) and 500 yards 118° (SE. by E. $\frac{1}{4}$ E.) from Harsens Island Middle Light No. 8.

A shoal, with $17\frac{1}{2}$ feet over it, lies near the eastern side of the channel about 425 yards eastward of Sans Souci post office.

A shoal bank extends 200 to 300 yards eastward of Harsens Island from Sans Souci post office to Russell Island.

Belle River, Mich.—This stream runs from north to south through Marine City and empties into the St. Clair River about 7 miles above Algonac.

Originally it had a depth of 6 feet, but a channel 50 feet wide was dredged for a distance of about a mile to depths of 12 and 13 feet so as to provide an ice harbor of refuge. It is now almost exclusively used as a winter harbor for vessels of medium size.

Project—Reference plane.—The local elevation of the project datum plane to which depths are referred (corresponding to Lake Huron and Lake St. Clair project planes of low-water datum) is 575.8 feet above mean sea level.

Channel.—Soundings taken in 1915 showed that from the mouth of the river for a distance of about 2,900 feet there was not less than 11 feet of water, the channel being quite narrow; thence to Broadway Road Bridge, 2,500 feet farther, the depth varied from 10 to about 8 feet.

Above the Government improvement the river is navigable by boats drawing not over 6 feet for about 2,800 feet upstream to the north boundary of Marine City, where a trestle highway bridge, without opening for the passage of vessels, bars further progress.

Bridges across Belle River at Marine City.

No.	Location and name.	Kind.	Distance above mouth.	Draw openings—clear width.		Clear head-room.	Condition of draws for passage.
				Right. ¹	Left. ¹		
			<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	
1	Rapid Ry. (electric).....	Railway.....	1,100	50	50	6 $\frac{1}{2}$	Both clear.
2	Bridge Street.....	Highway.....	2,500	40	40	6	Do.
3	Broadway.....	do.....	5,400	40	40	5	Do.

¹ Looking downstream.

Signal for opening draws, 3 blasts (— — —).

Bridges are lighted according to United States Lighthouse Bureau regulations for lighting bridges.

Harbor rules and regulations.—None enforced by the Government, but a village harbor master regulates the location and movement of vessels.

Marine City lies about 7 miles above Algonac and just above Woodtick Island. The population is about 4,000. It has large salt works and a shipyard.

Recors Point lies on the western (American) side of the river 3 miles upstream from Marine City.

Recors Point Light, occulting white 30 feet above water, is shown from a black cylindrical tank about 880 yards upstream from the point.

Range Lights—Lower Reach Lower Light (No. 1 Front), fixed white, 28 feet above water, is shown from a mast, with a white daymark, on the northern shore in the first bend about $2\frac{3}{4}$ miles from St. Clair Flats Canal Upper Lighthouse.

Lower Reach Middle Light (No. 2 Rear), fixed red, 41 feet above water, is shown from a tripod, with a white daymark, 300 yards 68° (ENE. $\frac{3}{4}$ E.) from the front light.

These in range lead through South Channel for 1,100 yards from a point about 2 miles northeastward of St. Clair Flats Canal Upper Lighthouse. (See Chart.)

Lower Reach Upper Light (No. 3 Front), fixed white, 28 feet above water, is shown from a cluster of piles with a white day mark, on the northern shore, 333 yards 130° (SE. $\frac{1}{4}$ E.) from Middle Light No. 2.

This in range with Middle Light No. 2 astern, lead through the channel from a point nearly abreast Southeast Bend Light No. 1 to a point nearly abreast Southeast Bend Lower Light No. 4. (See Chart.)

Southeast Bend Light No. 1, occulting red, 23 feet above the water, is shown from a pole mounted on piles on the southern side opposite Joe Bedore's wharf.

Southeast Bend Light No. 2, occulting red, 23 feet above water, is shown from a pole mounted on piles at the entrance to Little Basset Channel.

Southeast Bend Lower Light No. 4, fixed white, with a red sector, 18 feet above the water, is shown from a post near the northern shore about 500 yards 79° (E. $\frac{3}{4}$ N.) from Southeast Bend Light-house No. 2. (For sectors see light list.)

Southeast Bend Middle Light No. 5, fixed red, 16 feet above water, is shown from a white lamp house on the northern shore 900 yards eastward of Southeast Bend Lower Light No. 4.

Southeast Bend Upper Light No. 6, fixed white, with a red sector, 18 feet above water, is shown from a post located on the northwestern shore opposite the junction with Basset Channel.

Southeast Bend Light No. 3, occulting red, 23 feet above water, is shown from a pole on piles opposite Southeast Bend Middle Light No. 5.

Southeast Bend Light No. 4, occulting red, 23 feet above water, is shown from a pole about 170 yards north of Canada Club wharf.

Southeast Bend Light No. 5, 23 feet above water, is shown from a pole on the eastern side of the channel, 1 mile 25° (NNE. $\frac{1}{2}$ E.) from Southeast Bend Light No. 4.

This light marks the western edge of the flat extending from the western side of Squirrel Island.

Range Lights—Harsens Island Lower Light (No. 7 Rear), fixed red, 26 feet above water, is shown from a white tripod, with a day mark, at the lower end of the island, 350 yards 238° (SW. by W. $\frac{1}{2}$ W.) from Harsens Island Middle Front Light No. 8.

Harsens Island Middle Light (No. 8 Front), fixed white, 18 feet above the water, is shown from a white pile cluster, with a day mark, located in the water near the eastern shore of the island.

These in range bearing 241° (SW. by W. $\frac{3}{4}$ W.) lead through the channel to Fish Dock.

Harsens Island Upper Light No. 9 Rear, fixed red, 31 feet above the water, is shown from a white tripod, with a day mark, located 175 yards 23° (NNE. $\frac{3}{4}$ E.) from Harsens Island Middle Light No. 8.

This light in range with Middle Light No. 8 leads through the channel, for $1\frac{1}{4}$ miles, from Southeast Bend.

Russell Island, separating North and South Channels, is about 1,540 yards long northeast and southwest, with a maximum width of 660 yards.

Russell Island Shoal.—Algonac is cut off from direct access to the main or South Channel of the St. Clair Flats by Russell Island Shoal, a shallow bank extending in a north-northeast direction about 1,000 yards from the head of Russell Island.

Range Lights—Russell Island Lower Light (No. 10 Front), fixed white, 18 feet above water, is shown from a white post on a concrete pier, 540 yards 222° (SW. $\frac{1}{8}$ W.) from Middle Rear Light No. 8.

Russell Island Middle Light (No. 11 Rear), fixed white and fixed red, 33 feet above water, is shown from a white mast with a square day mark on the western side of the channel in the water abreast the woods on the island.

These in range bearing 44° (NE. $\frac{1}{4}$ E.) lead through the channel from abreast Lemke to Russell Island.

Russell Island Upper Light, fixed red, 18 feet above water, is shown from a white post on a concrete pier, 500 yards 27° (NNE. $\frac{3}{4}$ E.) from Russell Island Middle Light No. 11.

Russell Island Shoal Light Buoy, exhibiting a flashing white light, is moored in 20 feet, on the northeast point of Russell Island Shoal.

Walpole Island Light.—The lower light, occulting red, 18 feet above water, is shown from a wooden pole, on piles, in 5 feet of water, on the eastern side of the channel midway between Russell Island Light No. 12 and Russell Island Shoal Light Buoy.

The upper light, similar in character, is shown from a similar structure on the eastern side of the channel nearly opposite Russell Island Shoal Light Buoy.

Directions—South Channel.—To enter South Channel from St. Clair Flats Canal, if proceeding from East Channel head 41° (NE. $\frac{1}{2}$ N.), hauling gradually to northwestward for about $\frac{1}{2}$ mile until in midchannel. If proceeding from West Channel head 42° (NE. $\frac{1}{2}$ N.), hauling gradually to northeastward until in midchannel.

Proceed upstream, keeping in midchannel until on the range of Lower Reach Lights, Lower Front No. 1 and Middle Rear No. 2, when proceed on that range until within 500 yards of the front light, then haul gradually to eastward and then southeastward, keeping in midchannel until Lower Reach Lights, Upper No. 3 and Middle No. 2 are in range astern. Keeping these in range astern, steer 130° (SE. $\frac{1}{2}$ E.) until Southeast Bend Lower Light No. 4 bears 51° (NE. $\frac{3}{4}$ E.), when steer various courses, keeping in midchannel and passing between the "passing" lights on both banks of the river until on the range of Harsens Island Lights, Middle No. 8 and Upper No. 9. Steer 23° (NNE. $\frac{3}{4}$ E.) on this range until within 450 yards of Middle Light No. 8, when haul gradually to eastward, keeping to the western side of the channel until Harsens Island Lights, Lower No. 7 and Middle No. 8, are in range astern, bearing 238° (SW. by W. $\frac{3}{4}$ W.) with these lights in range astern steer 58° (NE. by E. $\frac{3}{4}$ E.) until Russell Island Light, Lower No. 10 and Middle No. 11 are in range bearing 42° (NE.); steer on that course until Grande Pointe Dock bears 352° (N. $\frac{3}{4}$ W.), when change course to eastward and proceed in midchannel until past Russell Island Shoal Light Buoy. (There are lighthouses in this part of the river and a mariner should fix the vessel's position by bearings of them at frequent intervals.)

North Channel separates from the main channel at Russell Island and Algonac. It trends southwestward about $1\frac{1}{2}$ miles to Pointe Aux Chenes, then westerly for about 6 miles, emptying into Anchor Bay.

It has good depth and width throughout, but is rendered useless for through navigation by shoal water at its mouth.

Chenal A Bout Rond and Middle Channel are branches of it.

Algonac, Mich.—A village and summer resort opposite Russell Island, at the head of North Channel. It has a salt block, flour, saw, and planing mills, and boat building is extensively carried on. The Rapid Railway (electric) from Detroit to Port Huron runs through the village. There is a steamboat landing and other docks, with 12 to 15 feet of water.

St. Clair River—Upper part.—The St. Clair River from its source, in Lake Huron, to Russell Island, about 29 miles, flows in a general 185° (S. $\frac{1}{4}$ W.) direction. Its course is sinuous, but it has few isolated shoals to menace navigation.

Chenal Ecarte branches off to eastward about $1\frac{1}{2}$ miles above Russell Island. It is very narrow, winding, and shallow, and is unfit for navigation except by small craft.

Chenal Ecarte Range Lights.—The front light, fixed white, 10 feet above water, visible 1 mile, is shown from a mast with a white, diamond-shaped, slatted day mark with a black vertical stripe near the north end of Walpole Island.

The rear light, fixed white, 22 feet above water, visible 1 mile, is shown from a mast with a white diamond-shaped slatted day mark with a black vertical stripe, 67 yards 138° (SE. $\frac{1}{4}$ S.) from the front light.

These in range lead from St. Clair River into Chenal Ecarte.

Buoy.—A red spar buoy marks the northwestern extremity of the shoal from Chenal Ecarte.

Shoal.—A detached shoal with $18\frac{1}{2}$ feet over it lies about 1,540 yards below the south end of Woodtick Island, a little to the westward of mid stream about the salt dock on the American shore.

Light buoy.—It is marked by a red light buoy showing a flashing red light.

Port Lambton, Ontario.—A village about 1 mile above the Chenal Ecarte, and on the line of the Pere Marquette Railway. There is one wharf with a depth of 20 feet, at which the White Star Line steamers stop.

Woodtick Island is about $\frac{1}{2}$ mile long northeast and southwest, 400 yards wide, and lies in the eastern (Canadian) side of the channel. Shoal water extends for about 800 yards from the northern end and about 600 yards from the southern end.

Buoy.—A red and black horizontally striped spar buoy moored in 20 feet marks the extreme point of the shoal extending from the southern end of the island.

Channels.—The main channel passes on the American side of the island and the middle ground, with a width of not less than 1,000 feet of deep water.

The channel passing to eastward of Woodtick Island and the middle ground has a width of not less than 300 feet of deep water, but is slightly winding and unmarked, and is less frequently used.

Marine City Shoal.—There is a shoal middle ground in the river abreast of Marine City, having a least depth of about 14 feet below local elevation 575.8 feet above mean sea level (river stage corresponding to Lake Huron and Lake St. Clair project planes of low-water datum). This area is practically in extension of the shallow bank extending northerly from Woodtick (Fawn) Island.

Marine City Shoal Light Buoy (No. 4), exhibiting an occulting red light, 10 feet above the water, is moored in 20 feet on the western edge of the above shoal.

Buoy.—A red and black spar buoy marks the most northerly point of the shoal.

Sombra, Ontario, is a small village on the east channel opposite Marine City and on the line of the Pere Marquette Railway. It has two wharves $\frac{1}{4}$ mile apart, extending about 600 feet in shallow water to a depth of 12 feet at the outer ends.

Courtright, Ontario, is a village on the Canadian Channel opposite St. Clair and on the Pere Marquette and the Michigan Central Railroads. The latter road maintains a steam ferry between this place and St. Clair. There is good water along the wharves, with depths of 15 to 20 feet.

Pine River at St. Clair, Mich.—This is a small stream 100 to 150 feet wide, emptying into the St. Clair River near the southerly limits of the village. Its original depth was 5 to 8 feet over bars. It has been improved by the Government for a little over a mile from its mouth, but its commerce is limited to one shipyard, two brickyards, and some coal and lumber.

Channel.—Soundings of July 9-10, 1906, showed the channel to be 12.8 feet deep and 50 to 75 feet wide from the mouth to Sheldon's brickyard, a distance of about 2,800 feet, and 11.8 feet deep, and about 50 feet wide from there to Belknap & Phillip's brickyard, 3,900 feet farther upstream.

Bridge.—There is a highway drawbridge, carrying electric railway tracks, across the stream about 300 feet above the mouth. It has two draw openings 50 feet wide, but only the left or north draw can be used for the passage of vessels; the clear headroom is $9\frac{1}{2}$ feet. The bridge is swung by hand and is lighted according to United States Lighthouse Bureau regulations for lighting bridges. Signal for opening draw, 4 blasts (— — — —).

Shoals.—The river abreast of St. Clair is divided into two channels by the middle-ground shoals, which extend from about opposite the Salt Co. dock at Moore, Ontario, southerly to a point a little above the Oakland Dock, Michigan.

The American Channel, for downbound traffic, has a minimum width of 800 feet with a depth of 20 feet or more below local elevation 576.6 feet above mean sea level (river stage corresponding to Lake Huron and Lake St. Clair project planes of low-water datum).

The Canadian Channel, for upbound traffic, has a depth of 25 feet or more at the above stage, with a minimum width of about 800 feet. The most easterly shoals of the middle ground on the west line of the Canadian Channel are marked by two black spar buoys at points between the two end buoys above mentioned.

St. Clair Middle Ground Lower End Light Buoy, showing a flashing red light, is moored in 19 feet near the southern extremity of the shoals.

St. Clair Middle Ground Light Buoy, showing a flashing red light, is moored in 20 feet on the western side of the shoal, opposite Sheldons Dock.

St. Clair Middle Ground Upper End Light Buoy, showing a flashing white light, is moored in 20 feet at the northern end of the shoal.

Buoys.—A red spar buoy nearly abreast Pine River marks the southern extremity of the upper shoal.

Two black spar buoys mark the eastern side of these shoals.

St. Clair, about 7 miles above Marine City, is located at the mouth of the Pine River. The population is about 3,000. There is a shipyard, sawmill, iron works, and brickyard at this place.

Moore, Ontario, is a village at the northerly end of the Canadian Channel, $1\frac{1}{2}$ miles above Courtright, and on the Pere Marquette Railroad. There are two wharves with about 15 feet of water. Babys Creek enters the St. Clair River about $\frac{1}{4}$ mile below the village.

Rules and regulations for navigating the St. Clair River in the vicinity of St. Clair, Mich.:

All vessels must keep to the starboard, upbound vessels passing through the Canadian or eastern channel, and downbound vessels through the American or western channel.

This rule does not apply to local boats landing at points within this reach.

Penalties for violations.—Every person and every corporation which shall violate such rules and regulations shall be deemed guilty of a misdemeanor and, on conviction thereof in any district court of the United States within whose territorial jurisdiction such offense may have been committed, shall be punished by a fine not exceeding \$500, or by imprisonment (in case of a natural person) not exceeding six months, in the discretion of the court.

Stag Island Lower Light Buoy, showing an occulting white light, is moored in 23 feet on the western (American) side about 1,500 yards below Stag Island Light.

Stag Island, $1\frac{1}{4}$ miles long north and south and $\frac{1}{2}$ mile wide, lies in front of Corruna, and is Canadian territory.

Shoals extend 1,100 yards from the northern extremity and $1\frac{1}{2}$ miles from the southern extremity.

Stag Island Shoal Light, fixed white, 20 feet above water, visible 4 miles, is shown from white wooden structure on a concrete pier on the south end of shoal.

Stag Island Middle Light, fixed white, 16 feet above water, is shown from a black post on the western side of the channel abreast the center of Stag Island.

Stag Island Upper Light Buoy, showing an occulting white light, is moored in 20 feet at the extreme northern end of the shoal extending from the northern end of Stag Island.

Stag Island Upper Light, fixed white, 16 feet above water, is exhibited from a white pyramidal slatted structure on the upstream corner of Marysville Dock.

Buoys.—Three red spar buoys mark the western edge of the shoal.

The American Channel, for down-bound traffic, has a minimum width of 300 yards, with a depth of 20 feet or more below local elevation 577.0 feet above mean sea level (river stage corresponding to Lake Huron and Lake St. Clair project planes of low-water datum).

The Canadian Channel, for upbound traffic, has a minimum width of 180 yards, with a depth of 27 feet or more at the above stage.

Corunna, Ontario, is a village on the Canadian Channel opposite Stag Island and on the line of the Pere Marquette Railway.

Rules and regulations for navigating the St. Clair River in the vicinity of Stag Island prescribed by the Secretary of War and concurred in by the Canadian Government:

All through-bound vessels in passing through the river at this point shall keep to the right; that is to say, all upbound boats shall pass through the eastern channel and all down-bound boats through the western channel.

This rule shall only apply to the through-bound vessels and not to vessels running between local points on the river, which vessels may take either channel, conforming to the ordinary rules of the road at sea.

Penalties for violations.—Every person and every corporation which shall violate such rules and regulations shall be deemed guilty

of a misdemeanor and, on conviction thereof in any district court of the United States within whose territorial jurisdiction such offense may have been committed, shall be punished by a fine not exceeding \$500 or by imprisonment (in case of a natural person) not exceeding six months, in the discretion of the court.

Corunna Range Lights.—The front light, fixed white, 50 feet above water, visible 2 miles, is shown from a white, square wooden tower in the village at the foot of Fane Street.

The rear light, fixed white, 69 feet above water, visible 2 miles, is shown from a white, square wooden tower 190 yards 167° (S. $\frac{1}{2}$ E.) from the front light.

These in range, astern, bearing 347° (N. $\frac{1}{2}$ W.) leads through the northern part of Canadian Channel.

Marysville, a village on the western side of the channel, has two lumber docks.

Sarnia, Ontario.—A city near the head of St. Clair River, opposite Port Huron and connected therewith by a railroad tunnel under St. Clair River, and by a regular steamboat ferry. It is an important harbor of the Grand Trunk Railway, and a stopping place for Canadian passenger steamers passing through the St. Clair River.

Harbor front.—From the foot of George Street $3\frac{1}{2}$ to 5 fathoms can be carried close to shore in front of and below the Grand Trunk Station and continuing down to the Imperial Oil Co.'s dock. Fronting the harbor to the north of the waterworks intake at the foot of George Street a turning and mooring basin 550 feet long and 300 feet wide was dredged in 1914 to a depth of 20 feet.

The anchorage near the head of St. Clair River, below the rapids and abreast of Sarnia, is good in clay and gravel. Good holding ground and some eddy will be found on the Canadian shore below the Grand Trunk elevator. Vessels should anchor as close to shore as safety will permit, to leave the midchannel clear for passing vessels.

Storm warnings.—Day and night signals are displayed from a mast at the foot of George Street, immediately adjoining the waterworks property. Forecasts are broadcasted by the Point Edward radio station at 11.10 p. m.

Regulation governing the speed of vessels navigating the St. Clair River in front of Sarnia may be obtained from the United States engineer's offices. Every master should have a copy and carefully comply with them.

Sarnia Bay is a shallow expanse separated from the main river channel by a peninsula extending about $\frac{3}{4}$ mile southerly from Point Edward and terminating in Bay Point. In 1918 there was a channel

1,050 feet long and 60 feet wide, with a depth of 16 feet, extending from deep water of Sarnia Bay to the Dominion Salt Co. Wharf.

Bay Point Light, group flashing white, 16 feet above water, visible 1 mile, is shown from a pole on the southern extremity of the narrow neck extending southward from Point Edward.

Point Edward, Ontario.—Situated at the head and on the east side of the St. Clair River, adjoining the town of Sarnia. It is an important shipping terminal of the Grand Trunk Railway and a port of call for many large Canadian vessels. The Canadian Government maintains a channel about 21 feet deep along the front of the docks, to afford safe entrance and exit for the largest vessels. The locality is subject to continual shoaling, requiring annual dredging for maintenance of the channel. The ground is rocky and bad in the rapids at Point Edward, but anchorage may be had abreast of Port Huron and Sarnia.

A radio station is operated by the Canadian Government all the year; after close of navigation, the station is not open between 8 p. m. and 8 a. m.; call letters VBE; working distance 350 miles.

Point Edward Range Lights.—The front light, fixed red, 35 feet above water, visible 7 miles, is shown from a white, square wooden tower on the shore of Lake Huron near the head of the St. Clair River.

The rear light, fixed red, 58 feet above water, visible 7 miles, is shown from a white, square, wooden tower 193 yards 180° (S. $\frac{1}{4}$ W.) from the front light.

These in range, astern, bearing 180° (S. $\frac{1}{4}$ W.) lead, clear of the shoals near the river entrance.

Port Huron is situated at the head of the St. Clair River, at the foot of Lake Huron. It is also at the mouth of the Black River, which passes through the city in a southeasterly direction and empties into the St. Clair River about $2\frac{1}{4}$ miles below its head.

The city has several stately public buildings, shipyards with extensive dry docks, grain elevators, railroad shops, manufactories of agricultural implements, gas and gasoline engines, etc. The population in 1920 was 25,944.

There is good holding ground in clay or gravel between Port Huron and Sarnia.

Shoal.—The shoal in St. Clair River at and below the mouth of Black River is about 1 mile long north and south and $\frac{1}{4}$ mile wide at its widest part.

Between the buoys, marking it, and the Canadian shore is a channel with a minimum width of 1,000 feet and a depth of more than 19 feet. In this channel at a point about 600 feet northeast of the

light buoy, the depth is only about $19\frac{1}{2}$ feet, and the same limiting depth will be found below a line extending from this point north-westward toward the American shore.

Caution.—Downbound vessels whose draft exceeds $19\frac{1}{2}$ feet, when rounding the bend at this locality, should keep 1,200 feet to the north of the light buoy and should hold to the eastward on the turn so as to clear the outlying point above mentioned, passing down within 800 feet of the Canadian shore abreast of the Sarnia ferry dock. There is also a current on this turn which is liable to interfere with the steerageway of downbound vessels, in holding the inside of the curving channel.

A survey made in 1914 showed that in recent years considerable portions of the shoal have been removed by private dredging, but in a disconnected way so as not to afford passage for large craft between the buoys and the American shore. The limiting available depth inside of the buoys is about 15 feet.

Head of Shoal Light Buoy, showing a flashing white light, is moored in the middle of the river abreast the mouth of Black River.

Buoy.—A black spar buoy marks the extreme eastern edge of the shoal.

Proposed channel.—The construction of a channel along the water front of Port Huron, to be 400 feet wide and 21 feet deep, was begun in 1920. It is to be completed in 1921.

Storm warnings.—Day and night signals are displayed from a flagstaff on the roof of the Federal Building, corner of Water and Sixth Streets, and from a steel tower at Miller's coal dock, 2322 Military Street, on the river bank.

Black River, Mich.—This stream passes through Port Huron in a southeasterly direction and empties into the St. Clair River about $2\frac{1}{4}$ miles below its head, or the foot of Lake Huron.

Channel.—During 1920 the entire channel up to Washington Avenue was dredged to a depth of 17 feet, with width of 125 feet at the mouth and of 100 feet to a point above the Grand Trunk Railway Bridge, where it narrows to 75 feet.

Above the improvement the Black River is navigable for small boats to beyond the Elmwood Street highway bridge, which has a draw opening for passage of vessels.

Fluctuations of water surface.—Each year the level of the Black River rises and falls from 4 to 6 feet, due to the fact that the spring freshets raise the level considerably above the normal. From day to day the level changes somewhat, due to wind, such changes amounting to several inches.

Bridges across Black River at Port Huron.

No.	Location and name.	Kind.	Distance above mouth.	Draw openings (clear width).			Clear head-room.	Condition of draws for passage.
				Right. ¹	Left. ¹	Center.		
			<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	
1	Pere Marquette Ry.....	Railway.....	400	45	45		6	Both clear.
2	Military Street.....	Highway.....	1,700			70	11	Clear.
3	Seventh Street.....	do.....	2,600	56	56		14.5	Both clear.
4	Tenth Street.....	do.....	4,900	59	57		14.5	Do.
5	Grand Trunk Ry.....	Railway.....	8,200	45	45		14	Do.
6	Elmwood Street.....	Highway.....	14,900	33	33		9	Do.

¹ Looking downstream.

Signal for opening draws, 1 long, 2 short, 1 long (— — — — —); bells on the bridges sound return signals.

Bridges are lighted according to United States Lighthouse Bureau regulations for lighting bridges.

Rules and regulations to govern the opening of the Pere Marquette Railroad bridge across Black River near its mouth.

1. The bridge shall be equipped with a loud-sounding bell that may be heard plainly at a distance of three-eighths of a mile.

2. When a vessel unable to pass under the closed bridge approaches it, the signal of intention to pass through the draw and for the draw to be opened shall be four blasts of a steam whistle sounded as follows when the vessel is about one-fourth mile distant: One long, two short, one long.

3. When a vessel unable to pass under the closed bridge is about to leave a landing near by with the intention of passing through the draw, the person in command of such vessel shall cause the prescribed signal to be sounded before leaving the landing, and at an interval which will permit the opening of the draw in time for the vessel to pass.

4. When the signal for opening the bridge is given as hereinbefore prescribed it shall be immediately answered, if the draw is ready to be opened, by four strokes of the bell, and the draw shall be opened at once for the passage of the vessel: *Provided*, That the opening of the draw may be delayed not to exceed five minutes to permit the passage of a train actually on the bridge or approaching so closely that it can not be safely stopped before reaching the draw span.

5. In case the draw can not be immediately opened when the signal is given, a red flag or ball by day and a red light by night shall be conspicuously displayed on the bridge, and the signal shall be answered immediately by six strokes of the bell, given in quick succession. As soon as the bridges can be opened, the draw tender shall give four strokes of the bell as a signal for the vessel to prepare to pass.

Dry docks.—There are two timber graving docks and one floating dock at Port Huron. The larger graving dock is 412 feet long over

all, 392 feet on blocks, 62 feet width of gate, 95 feet at top, and 18 feet depth on miter sill at ordinary stage of river; the smaller graving dock is 270 feet long, 255 feet on blocks, 50 feet width of gate, and 6 feet depth on miter sill. The floating dock is 210 feet long, 195 feet on blocks, 32 feet width, 36 feet at top, and 13 feet depth.

Port Huron Rapids.—The Port Huron Rapids are about 2 miles above the city wharves and abreast of the Grand Trunk Railroad shops, which are located just south of Fort Gratiot Lighthouse. The velocity of the current through the rapids is about 5 miles an hour.

Fort Gratiot Range Lights.—The front light, 42 feet above water, visible 14 miles, is shown from a black, pyramidal skeleton tower on the western side of the river near the head.

The rear light, fixed red, 64 feet above water, visible 15 miles, is shown from a white skeleton pyramidal tower, located 212 yards 207° (SSW. $\frac{1}{4}$ W.) from the front light.

These in range astern bearing 207° (SSW. $\frac{1}{4}$ W.) lead through the rapids into Lake Huron.

Directions—St. Clair River—Upper part.—Proceeding upstream from Russell Island, keep in mid-channel until near Woodtick Island, when alter course to westward to pass the island and adjacent shoals if for the main channel, which is on the American side.

If the Canadian channel is desired alter course to the eastward. There are no aids for this channel and it should not be used without local knowledge.

Past Woodtick Island and shoals, keep in mid-channel until near the towns of St. Clair and Courtright, when alter course to the eastward to clear the middle ground and proceed through the up-bound (Canadian) channel.

When clear of the middle ground proceed in mid-channel until near Stag Island when change course to eastward. Entering the Canadian channel, the one for up-bound traffic, proceed in mid-channel until on the range of Corruna Lights; with these in range astern, proceed through the upper part of Canadian channel until clear of Stag Island and shoals. Keep to mid-channel until near the shoal at the mouth of Black River when alter course to eastward, keeping to the Canadian side and passing eastward of the spar buoy and gas buoy marking the eastern side of the shoal; then mid-channel until abreast Bay Point Light when direct course to westward keeping to the American side, to avoid three isolated shoals in mid-channel abreast the grain elevator on the Canadian side. Proceed, keeping to the American side, until on the range of the Fort Gratiot Range Lights; with these in range astern, steer 27° (NNE. $\frac{1}{4}$ E.) through the rapids. Continue on this course until Port Edward Range Lights are in range astern, 180° (S. $\frac{1}{4}$ W.) when steer 0° (N. $\frac{1}{4}$ E.) into Lake Huron.

CHAPTER III.

LAKE HURON—GENERAL REMARKS—WESTERN SHORE—FORT GRATIOT TO THE STRAITS OF MACKINAC.

The depths given in this chapter are referred to low-water datum, the reference plane for U. S. river and harbor improvements, which for Lake Huron is an elevation of 579.6 feet above mean sea level. Depths on the Lake Survey charts, referred to standard low water, are 1 foot less than those herein published.

General information.—**Lake Huron** is 243 miles long from Fort Gratiot to the Straits of Mackinac and 220 miles from Fort Gratiot to Detour Passage entrance. It is 101 miles broad at its widest part abreast of Thunder Bay. Its maximum recorded depth is 750 feet. Its surface is 581 feet above mean tide at New York City. It is 21 feet below the mean surface of Lake Superior and 9 feet above the mean surface of Lake Erie. It is a connecting link in the chain of the Great Lakes, which receives the waters of Lake Michigan through the Straits of Mackinac, and those of Lake Superior by way of the St. Marys River, and discharges into the St. Clair River at Fort Gratiot. The depth of water prevailing in these two rivers and at the Limekiln Crossing in the Detroit River has always limited the size and draft of vessels navigating Lake Huron to and from Lake Erie. The mouths of the few navigable streams emptying into the lake along the west shore were obstructed by sand bars which had been formed by the action of high waves and winds and by sediment carried down the streams during spring freshets. At Cheboygan, Alpena, and Au Sable lumber docks were built by private parties—owners of sawmills—on both sides of a channel dredged across the bars, and these wharves have been extended from time to time until they have become revetments for the channel improvements subsequently made by the Government.

The improvement of the ship channel connecting the waters of the Great Lakes between Chicago, Duluth, and Buffalo has permitted the introduction of larger vessels with correspondingly increased draft, which can pass with safety and speed through Lake Huron.

There are no harbors along the west coast of Lake Huron with sufficient navigable depth of water to accommodate the largest vessels, either for loading or unloading. The local traffic along the west shore consists, therefore, of small and medium-sized vessels, lumber barges, schooners, lake tugs, and passenger steamers which can make

landings at all shore points which have sufficient depth of water to accommodate them. Between Fort Gratiot and Pointe aux Barques there are a number of private piers or wharves built out from the shore into deep water, where landings may be made in favorable weather. Within this reach the lake bottom is composed of rock and boulders, except at the harbor of refuge, formerly and appropriately known as Sand Beach Harbor, because it was the only sandy beach found between Fort Gratiot and Saginaw Bay, and therefore afforded good anchorage for small vessels. As improved, this harbor has a sheltered area of 650 acres and two entrances with an available depth of 20 feet and over, but is seldom used by the largest craft, perhaps because they are expected to weather the most violent storms in midlake.

The improvements made along the west shore of Lake Huron by dredging channels across the outer bars at the entrance to Cheboygan and Alpena Harbors and the Saginaw River have been and are now of considerable benefit to the growing commerce at these places.

CURRENTS.

The currents in Lake Huron differ from those in Lake Michigan in having the main current along the west coast instead of the east coast. This current along the west coast is strong some distance out, and extends the length of the lake, turning near the south end and passing up the east coast. There is also a return current passing not far south of Manitoulin Island and at some distance from the coast. At the northwestern end of the lake there are also signs of a return current.

A current passes into Great Saginaw Bay, and a current which sometimes attains a strength of $\frac{1}{2}$ knot an hour passes into Georgian Bay by the main entrance.

There are no tides and but light currents on the lakes, and as these are the most uncertain of all elements for the navigator to calculate and allow for, the danger of navigation on the lakes is reduced. Given a reliable compass that is regularly and frequently checked, and accurate up-to-date charts, a mariner experienced in laying and correcting courses for variation and deviation may keep the ship's position correctly and almost continuously plotted by cross bearings of prominent points.

ICE.

The average date of the opening of navigation on Lake Huron at Fort Gratiot is April 6, and the average date of the closing of navigation at Fort Gratiot is December 19. The general navigation of the lakes opens with the opening of the Straits of Mackinac, which occurs, on the average, about April 20, though it has opened as early

as April 2. The close is largely influenced, however, by the insurance companies. In 45 years the earliest opening has been April 2 and the latest May 4.

COURSES AND DISTANCES.

Vessels from St. Clair River bound to points westward of Duck Islands, should skirt the Michigan coast as far as Harbor Beach Lighthouse, the course to a position $3\frac{1}{2}$ miles eastward of which from Lake Huron Light Vessel is 352° (N. $\frac{3}{4}$ W.) and the distance 56 miles.

This course continued for an additional 119 miles will take a vessel to within $2\frac{1}{2}$ miles of Jennie Graham Shoal Bell Buoy, Duck Islands.

For a vessel bound to Georgian Bay from St. Clair River, the course from abreast the light vessel to a position $1\frac{1}{2}$ miles westward of Gat Point of Cove Island is 11° (N. by E. $\frac{3}{4}$ E.) and distance 159 miles.

From Goderich to the position $2\frac{1}{2}$ miles south of Jennie Graham Shoal Bell Buoy, the course is 336° (N. by W. $\frac{3}{4}$ W.) and distance 138 miles.

From the same port to the turning into Detour Passage the course is 325° (NNW. $\frac{3}{4}$ W.) and distance 184 miles.

From Cove Island Lighthouse the course to the above position $2\frac{1}{2}$ miles south of the bell buoy is 286° (W. by N. $\frac{3}{4}$ N.) and distance 61 miles.

From the given position south of Jennie Graham Shoal Bell Buoy to the turning into Detour Passage the course is 299° (NW. by W.) and distance 51 miles.

From the position south of the bell buoy to a position 2 miles northward of Spectacle Reef Lighthouse the course is 285° (W. by N. $\frac{3}{4}$ N.) and distance 60 miles.

Plan.—The coast, bays, lights, and harbors on the western shore of the lake, beginning with Fort Gratiot, will now be described in regular order.

Fort Gratiot Light, fixed and flashing white, 82 feet above water, visible 17 miles, is shown from a white conical wood tower, located on the mainland, western side, northern entrance to St. Clair River.

Fog signals.—The fog signals are made on a steam whistle and an air diaphone. (See Light List.)

Caution.—Approaching St. Clair River in clear weather and hearing the fog signal sounding blasts of 5 seconds followed by a silent interval of 55 seconds, masters may conclude there is a fog in the river and act accordingly.

Lake Huron Light Vessel exhibits a fixed white light, 40 feet above water, visible 13 miles. It has a red hull, and two masts with

black circular daymark at foremast head, "Huron" on both sides. It is moored in 20 feet at the south end of the lake; approximate position, latitude $43^{\circ} 02'$, long. $82^{\circ} 25'$.

Fog signals are made on a steam whistle and a submarine bell.

Buoys.—A red spar buoy is moored in 19 feet of water about 800 yards south of the light vessel and 160 yards east of the Point Edward Range line. Abreast this buoy is placed a black spar buoy in 19 feet of water and 160 yards west of the Point Edward Range line.

Anchorage—Caution.—Many shallow mounds of dumped material with 17 feet or less water over them extend over 340 yards northeastward from the light vessel. In addition to these, sunken wreckage with the same depth over it lies 3.3 miles 34° (NE. $\frac{1}{4}$ N.) from Fort Gratiot Lighthouse.

Shoals.—About 300 yards to the eastward of the axis of the Point Edward Range and to the southward of the light vessel are several detached shoals having less than 18 feet of water over them, as follows:

Corsica Shoal lies $\frac{3}{4}$ mile eastward of the axis of the ship channel and abreast of Huronia Beach, with 17 feet of water.

Harlem Shoal lies $\frac{3}{4}$ mile eastward of the axis of the ship channel, with a little over 17 feet of water.

Northwest Shoal lies about 1,250 feet 174° (S. $\frac{1}{4}$ E.) from Lake Huron Light Vessel, with 15 feet of water over it.

A shoal with spits having depths of 13 to 17 feet extends from Fort Gratiot Light northward to beyond Gratiot Beach and three-fourths mile offshore.

Coast.—Between Fort Gratiot and Lexington, a distance of about 18 miles, the coast should not be approached nearer than $1\frac{1}{4}$ miles.

Shoal.—About 8 miles southward of Lexington there is a detached rocky shoal, with a depth of 17 feet, 1,540 yards northeastward of the mouth of Burch Creek.

Life-saving station.—About 5 miles northward of Fort Gratiot Light at Lakeview Beach there is a life-saving station and also a storm signal station. Weather signals are displayed from a flag-staff 100 feet from the lake. Oil lights are used at night.

Dredged channel.—The entrance to St. Clair River is obstructed by a bar, through which has been dredged a channel nearly 880 yards wide, having in it a depth of 20 feet. The outer end and shoalest part of the series of shallow spots from Point Edward, and over which not less than $14\frac{1}{2}$ feet will, at the same datum, be found, is situated 10° (N. by E. $\frac{1}{4}$ E.) $1\frac{1}{4}$ miles from Point Edward Front Range Light. Vessels drawing less than 14 feet (except in heavy

weather) may pass over the shoals off the point and safely enter the river by giving the south shore of the lake a berth of 880 yards.

Directions.—In entering the river, deeply laden vessels should bring the Point Edward Range Lights (described in Chapter II) to bear 180° (S. $\frac{1}{4}$ W.) when about 3 miles off, to get the best water through the dredged channel. If drawing less than 14 feet it is only necessary to avoid passing west of the range.

Wreck—Light buoy.—A light buoy, exhibiting a flashing red light, is moored in 60 feet at the northwestern end of the wreck of the *Charles S. Price*, which lies $8\frac{1}{2}$ miles 20° (NNE. $\frac{1}{4}$ E.) of Lake Huron Light Vessel.

Lexington is an open roadstead $21\frac{1}{2}$ miles north of Port Huron. There is a dock in poor condition, with 10 feet of water. Good holding ground of clay is found offshore in 4 or 5 fathoms. There are several mills in the village, and a few passenger and freight steamers make the port.

Wreck.—A wreck lies 0.8 mile 129° (SE. $\frac{1}{4}$ E.) from the southeast corner of Lexington Dock. When examined in September, 1914, a least depth of 14 feet was found over the highest part of the remains. There is more than 23 feet depth all around the wreck.

Port Sanilac.—From Lexington to Port Sanilac the coast is rocky and can be approached to within 1 mile. Port Sanilac has one dock with about 9 feet of water.

Port Sanilac Light, fixed red, 69 feet above water, visible 10 miles, is exhibited from a white octagonal tower, located in the village.

Coast.—Northward of Port Sanilac the character of the coast continues rocky. One mile north of Port Sanilac and $\frac{1}{4}$ mile offshore, there is a spot with a depth of 4 feet. About $11\frac{1}{2}$ miles above Port Sanilac and $\frac{1}{4}$ mile off Indian Creek in a northeasterly direction, there are rocks with 4 to 6 feet depth, $\frac{1}{2}$ mile from shore. Forester and Forestville, respectively about 5 miles and $16\frac{1}{2}$ miles north of Port Sanilac, have docks with about 10 feet of water. Above White Rock Point, 9 miles south of Harbor Beach, there are rocks and rocky spots extending $\frac{1}{2}$ to $\frac{3}{4}$ mile offshore, and this character continues 3 miles northerly to Elm Creek, where a bad spit with depths of 3 to 7 feet extend $\frac{1}{4}$ mile in a north-northeasterly direction.

Harbor (Sand) Beach.—This harbor is located on the west shore of the lake about 60 miles north of Port Huron, which is at the head of St. Clair River. Originally there was no harbor at this locality, the existing one being formed by inclosing a large area in the lake with breakwaters and deepening a part of this area by dredging. This artificial harbor affords the only safe refuge on the west shore from the foot of the lake to Tawas Bay, a distance of about 120 miles.

Breakwaters.—There are three separate piers or breakwaters covering the sheltered area on the north, northeast, and east sides. The north pier starts in shallow water 250 yards from the shore line and extends about east-southeast for 501 yards. The main pier commences 100 yards eastward of the end of the north pier, extends on the same line 105 yards, thence southeasterly 1,356 yards, then due south 328 feet. The south pier commences 600 feet south of the end of the main pier and extends 652 yards on a north and south line. The south end of this pier stands in about 9 feet of water at a distance of about 733 yards from shore.

Harbor and entrance.—The harbor affords good protection from all winds. Mooring posts are provided along the breakwaters. The sheltered area is about 650 acres, in 72 acres of which the depth of water is 19 feet or more. There is an entrance to the harbor 200 yards wide from the east, which is the main entrance; the harbor is inaccessible from the south except by vessels drawing less than 8 feet of water. The main entrance has a depth of 23 feet for the full width, but during extremely low water and storms the available depth may fall below 18 feet. Equal or greater depth is found close to the main breakwater inside at all points between the main and north entrances. Shoal places in the harbor are marked by spar buoys. Vessels can reach the steamboat landing on a draft of about 12 feet.

Improvements.—It is proposed to deepen the main entrance to 23 feet and part of the harbor area to 21 feet.

Anchorage.—Vessels desiring to anchor will find good anchorage in 4 to $4\frac{1}{2}$ fathoms inside of and close to the breakwater.

Harbor master.—All vessels are required to take the berths assigned them by the harbor master, who is appointed by the United States Government.

Wreck.—The wreck of the *Chickamauga* lies about 730 yards 59° (NE. by E. $\frac{1}{2}$ E.) from the north light at the east entrance. It has a depth of 27 feet on it and is marked by a light and bell buoy.

Lights.—**Harbor Beach Light**, alternating flashing white and red, 54 feet above water, visible 15 miles, is shown from a white conical tower on the northern side of the eastern entrance.

Fog signal.—The fog signal is made on a diaphone.

Harbor Beach South Pier Light, flashing red, 27 feet above water, visible 8 miles, is shown from a brown skeleton tripod on the southern side of the eastern entrance.

Directions—East entrance.—Bring the main light to bear anywhere to the westward of 331° (NNW. $\frac{1}{8}$ W.) and head for the light. On reaching the entrance pass close to the main light, leaving it on the starboard hand, and haul at once to the northward to make fast to the snubbing post on the breakwater.

The coast-guard station is at the inner end of the dock in the harbor.

Storm warnings.—Day and night signals are displayed from a steel tower on the lake point at the foot of Lythe Street, visible to vessels passing in the lake.

Rules and regulations for the government of the Harbor of Refuge prescribed by the Secretary of War should be obtained on or before arrival and carefully complied with.

Coast.—Between Harbor Beach and Port Hope, about $7\frac{1}{2}$ miles, shoals extend out some distance, and the coast should not be approached within 2 miles.

Off Forest Bay there are several dangerous ledges with depths of 6 to 17 feet running north and south, and from 1 to $1\frac{1}{2}$ miles from shore.

Port Hope (Stafford), is 7 miles northward of Harbor Beach. It has one dock in good condition. There is 10 feet of water over the bar.

From Port Hope to Pointe aux Barques Light, a distance of 7 miles, the coast begins to trend more to the westward, and boulders and rocky spots stand out nearly 1 mile from shore.

Pointe aux Barques Light, flashing white, 93 feet above water, visible 18 miles, is shown from a white conical tower, on a point about 9 miles 110° (SE. by E. $\frac{1}{4}$ E.) from Pointe aux Barques.

This light marks the turning point from Lake Huron into Saginaw Bay.

Caution.—As shoal water extends from nearly 2 miles, vessels should be careful in approaching the land in this locality.

Reef.—Off Pointe aux Barques Lighthouse there is a dangerous reef, with a depth of 6 feet, extending out about $2\frac{1}{4}$ miles to the eastward of the light.

Coast-guard station.—A coast-guard station is located about 900 feet southward of the lighthouse.

Light and bell buoy.—A black cylindrical buoy with a skeleton superstructure and showing a flashing white light is moored in 36 feet $2\frac{1}{4}$ miles 56° (NE. by E. $\frac{3}{4}$ E.) from Pointe aux Barques Lighthouse to mark the eastern extremity of the reef.

Vessels should not pass inside of this buoy.

Coast.—From Pointe aux Barques Light to Pointe aux Barques, 9 miles northwesterly, ledges and detached rocky spots render the coast dangerous within $2\frac{1}{2}$ miles from shore.

Orion Rock, with 4 feet of water over it, lies about 1,320 yards off the shore about $2\frac{1}{2}$ miles northwest of Pointe aux Barques Light. A rocky ledge extends out and around Burnt Cabin Point $\frac{3}{4}$ mile to 1 mile from shore, but there is good water in a north-northeasterly di-

rection 440 yards off Pointe aux Barques, between the Burnt Cabin Point Ledge and Port Austin Reef off Pointe aux Barques.

Gridstone City, about $5\frac{1}{2}$ miles northwesterly from Pointe aux Barques Light, has one dock in poor repair, with about 8 feet of water.

Alaska Bay, at the end of Pointe aux Barques, is a small indentation, protected on the west by Port Austin Reef, and on the east by the rocky shoals off Burnt Cabin Point. A summer resort called Pointe aux Barques is located on the south and west shores of this bay.

Anchorage.—There is fair anchorage over clay and gravel.

Dock.—The dock, which has 14 feet alongside, is fit only for small boats.

Directions.—To enter the bay, bring the lightkeeper's brick dwelling situated on the west point of the bay to bear due south; stand in on this bearing until the door of the coast-guard station is in range with the west side of the dock bearing 202° (SSW. $\frac{1}{4}$ W.), when haul up sharp on this range carrying a uniform depth of 4 fathoms.

Coast-guard station.—A coast-guard station is located on the beach at the center of the indentation forming the bay.

Saginaw Bay.—Saginaw Bay, the largest indentation along the west shore of Lake Huron, has a width at the entrance, between Pointe aux Barques and Au Sable Point, of 26 miles, and from this line southwesterly to its head at the mouth of Saginaw River the distance is 51 miles. Its minimum width is 13 miles, between Sand Point on the east and Gravelly Point on the west in the outer portion of the bay; but, owing to the very shallow bank extending from the easterly shore to beyond the Charity Islands, and to the shoal projecting from Gravelly Point, the deep channel at this point of least width is contracted to a width of about $1\frac{1}{4}$ miles. The water level in Saginaw Bay is subject to sudden changes due to the wind, a northeast gale driving the water into the bay so as to raise the level at the mouth of Saginaw River 3 to 4 feet sometimes in less than as many hours, while a southwest wind lowers the level at times sufficiently to cause large vessels to ground on the bar at the river entrance.

The course across the mouth of the bay is dangerous in heavy weather. The anchorage is generally good in all parts of Saginaw Bay, excepting around Charity Islands, where it is rocky. Tawas Bay, at the westerly entrance, is a natural harbor of refuge, with good anchorage at its head in depths of $3\frac{1}{4}$ to 4 fathoms. At Au Sable (Fish) Point there is good holding ground, with protection from west to north winds.

Easterly shore, Pointe aux Barques to San Point, including Charity Islands.—Port Austin Reef reaches northwest $1\frac{1}{4}$ miles

from Pointe aux Barques and extends beyond Port Austin Reef Light. North-northwest $\frac{1}{2}$ mile from this light there is a reef with a depth of but 12 feet, running in an east and west direction for nearly $\frac{1}{2}$ mile. West of Pointe aux Barques there are flats extending offshore, reaching out about $\frac{1}{2}$ mile from shore around Flat Rock Point and along the coast to Port Crescent. Port Austin is situated about 2 miles southwest of Pointe aux Barques, on the shore of a shallow bay about $3\frac{1}{2}$ miles across between that point and Flat Rock Point.

Port Austin Reef Light, flashing red, 76 feet above water, visible 17 miles, is shown from a buff, square tower with fog-signal house attached, on the southern side of the entrance to Saginaw Bay.

Caution.—There is no passage between this light and the mainland. Vessels passing it should leave it 2 miles to the southward.

Fog signal.—The fog signal is made on a steam whistle.

Buoy.—A black can buoy moored in 35 feet marks the northern end of the reef lying 1,540 yards north-northwestward of Port Austin Reef Light.

Vessels should not pass inside of this buoy.

Coast.—West of Pointe aux Barques there are flats extending offshore reaching out about $\frac{1}{2}$ mile from the wharf at Port Austin and continuing at about that distance from shore around Flat Rock Point and along the coast to Port Crescent.

Port Austin.—A village on the southern side of the entrance to Saginaw Bay, lies on the shore of a shallow bay between Pointe aux Barques and Flat Rock Point. There are two piers with 9 to 10 feet of water. The village has stone quarries and stock-raising interests.

Flat Rock Point Reef.—A shoal with depths of from 5 to 8 feet lies with its southern end about $1\frac{1}{2}$ miles 326° (NNW. $\frac{1}{2}$ W.) of the wharf at Port Crescent, and runs thence 349° (N. $\frac{1}{2}$ W.) about 1 mile.

South of this shoal in the bay northwest of Port Crescent there is good water.

Hat Point Reef.—About 2 miles west of Port Crescent and 1 mile east of Hat Point a spit with a depth of 5 feet extends nearly due north 2 miles from the shore. At Hat Point a spit with a depth of 3 feet extends northerly nearly $\frac{1}{2}$ mile, with a 14-foot spot outside and about $1\frac{1}{2}$ miles from Hat Point.

Halfway between Hat Point and Oak Point a rocky shoal extends $1\frac{1}{2}$ miles from shore, with a least depth of 16 feet at its end and only 4 feet $\frac{1}{2}$ mile from shore.

Sand Point.—From Sand Point a sand bar puts out in a north-west direction for $1\frac{1}{2}$ miles, with a least depth of 1 foot, and a sand bank, with a 9-foot channel crossing it, extends to Little Charity Island.

Charity and Little Charity Islands are surrounded by flats extending about 2 miles in all directions. There is a rocky spot with only 1 foot depth about $1\frac{1}{4}$ miles southeast of Little Charity Island.

Charity Island Light, flashing white, 45 feet above water, visible 14 miles, is shown from a white, conical, stone, tower with a brick dwelling attached on the northwestern point of the island.

Light and bell buoy.—A light and bell buoy, showing a flashing white light, is moored in 40 feet off the northern end of Charity Island Shoal, 4 miles 329° (NNW. $\frac{3}{4}$ W.) from Charity Island Lighthouse.

Fog signal.—The fog signal is made on a bell operated by the motion of the waves.

Detached shoals off Charity Island.—A number of shoal spots, of rocky formation and very small extent, rise abruptly from depths of 4 to 6 fathoms beyond the shoal bank extending from Charity Island. The shoal most important as to location is an $18\frac{1}{2}$ -foot spot 3.6 miles 291° (NW. by W. $\frac{1}{4}$ W.) from Charity Island Light, being situated about midway of a line between Charity Island Shoal Light Buoy and Gravelly Point Light Buoy. Numerous other spots with depths ranging from 15 to 20 feet lie within the quadrant between bearings north and east from Charity Island Light and at distances ranging from 3 to $5\frac{1}{2}$ miles.

Sand Point to Saginaw River.—Southwesterly from the bank connecting Sand Point and the Charity Islands the entire easterly shore is filled by a sandy flat extending off from 8 to 10 miles within the 18-foot curve. The bottom on this flat is somewhat irregular, patches with 12 feet or less being scattered well over the entire area. The Quanicassee River, entering the southeasterly head of the bay, is practically closed by the bars at its mouth.

Sebewaing Harbor is at the mouth of the Sebewaing River, on the east shore of Saginaw Bay about 12 miles southerly of Sand Point and 20 miles east-northeast from the mouth of Saginaw River. In its original condition the river below Sebewaing had a crooked, shallow channel, with an available depth of about 4 feet. To remedy this condition a cut-off was dredged by private enterprise from the point where the fish house stands on a direct line to the bay. This cut-off is the channel improved by the United States.

Improvement.—The improvement of this harbor by the Government has been abandoned.

Channel.—The improved channel extends from the so-called "old channel" to about the 8-foot curve in Saginaw Bay, a distance of 3.2 miles. The axis of the outer channel bears about 290° (NW. by W. $\frac{1}{4}$ W.) and is marked by a range consisting of a diamond-shaped target on a telegraph pole on the south bank opposite the old channel, and the smokestack of the stave mill, 383 yards east of it.

Soundings taken in April, 1908, showed that the outer channel extending from the 8-foot curve in Saginaw Bay, which is about $3\frac{1}{2}$ miles from the east shore, was in good condition for about $1\frac{1}{2}$ miles, with a clear depth of 7 feet, hard bottom, and a nearly uniform width of not less than 75 feet. Toward shore the channel was improved during 1908 so as to give a width of 70 feet with 6 to 7 feet of water. No work has been done since 1908, as the local commerce does not warrant further improvement. At low lake level the greatest draft that can now be carried is not over 3 feet. The river is navigable to the docks at Sebewaing.

Revetment.—A pile dam 150 feet long, covered with dredged material, was built in 1905 across the old river bed, and a revetment extends from the dam 50 feet along the north shore of the main channel west of the junction.

Bridge.—The Pere Marquette Railroad Bridge crosses the river 800 feet east of the front range target. It is a girder swing bridge with a span 32 feet in the clear across the stream, the turntable being located on the north shore. It is operated by hand and carries no lights.

Coast.—The coast from Sebewaing trends southwestward to Quanicassee River thence northwestward to the Saginaw River. It is quite regular throughout, and shoal water extends for 7 to 8 miles from it.

Saginaw River flows in a northerly direction from the city of Saginaw 22 miles and discharges into Saginaw Bay at its southern extremity.

Channel.—The improved channel extends from deep water in Saginaw Bay into the mouth of the river, about $4\frac{1}{2}$ miles, and thence about 22 miles upstream to Green Point at the junction with Tittabawassee River. The channel was dredged 200 feet wide and $16\frac{1}{2}$ feet deep throughout its entire length. During low water the maximum draft that can be carried is about 16 feet.

Fluctuations of water surface.—Each year the normal level in Saginaw River rises and falls about 3 feet, as measured by the highest and lowest monthly mean stages. In addition, spring freshets and excessive rains may cause an abnormal rise of as much as 14 feet in the river at Saginaw. Occasionally a considerable change takes place within a few hours, resulting from the raising or lowering of Saginaw Bay by violent northerly or southerly winds, as mentioned under that head above.

Revetments.—The channel across the Carrollton Bar, 16 miles from the mouth, is protected on the east side by a pile revetment 5,728 feet long, and by a pile and plank beam wall 4,644 feet long on its west bank, the distance between revetments being 200 feet with

flaring sections at both ends. The dredged channel at Carrollton has been very stable since the pile piers were completed, but the latter have been damaged by fire and need repairs.

At the head of Crow Island there is a wing dam 900 feet long, with a plank beam extension 800 feet in length, along the east side of the main channel and opposite the village of Zilwaukee. This dam was designed to deflect the current from the Oneida channel east of Crow Island, but has not fully answered the purpose, as the Zilwaukee Bar forms periodically at its upper end and has had to be redredged several times. A portion of this pile dam has been damaged by fire and needs repairs.

Range Lights—Front Light.—A fixed red light, 39 feet above water, visible 13 miles, is shown from black, pyramidal skeleton tower with a red slatted elliptical daymark on the western side of the river.

Rear Light.—A fixed red light, 61 feet above water, visible 14 miles, is shown from a buff, square, pyramidal tower in the corner of a square dwelling 777 yards 184° (S. $\frac{1}{2}$ W.) from the front light.

These in range bearing 184° (S. $\frac{1}{2}$ W.) lead through the channel from deep water in the bay to the mouth of the river.

Saginaw River Entrance Light Buoy.—A red conical buoy with a skeleton superstructure and showing an occulting white light is moored in 18 feet on the western side of the entrance channel 4 miles 184° (S. $\frac{1}{2}$ W.) from the front range light.

Buoy.—A black spar buoy marks the eastern side of the entrance to the channel.

Buoys.—The entrance channel is marked by eight black spar buoys on the eastern side and a similar number of red on the western side.

The dredged channel in the river from Bay City to Saginaw is marked by numerous red and black spar buoys.

Bridges across Saginaw River.

No.	Location and name.	Kind.	Distance above lake.	Draw openings—clear width.			Clear head- room.	Condition of draws for passage.
				Right. ¹	Left. ¹	Center.		
IN BAY COUNTY.								
			Miles.	Feet.	Feet.	Feet.	Feet.	
1	Detroit & Mackinac Ry.	Railway	2.5	94	96	.....	7.8	Both clear.
2	Behnda Street	Highway	3.38	90	98	.....	12.2	Do.
3	Michigan Central R. R.	Railway	4.37	101	101	.....	8	Do.
4	Third Street	Highway ²	4.66	85	84	.....	18	Do.
5	Bay City Terminal Ry.	Railway	5.58	100	100	.....	10	Do.
	West Channel	do.	5.58	100	100	.....	10	Right clear; left obstructed.
6	Portsmouth or Twenty- third Street	Highway	6.2	73	72	.....	9.5	Both clear.
	West channel	do.	6.2	73	71	.....	9.5	Do.
7	Michigan Central R. R.	Railway ³	6.5	75	75	.....	9	Do.
8	South Center Street	Highway	7.19	69	67	.....	9	Do.
	West Channel	do.	7.19	73	73	.....	9	Right clear; left closed.
9	Interurban Ry	Railway	9.43	93	94	.....	7.4	Both clear.
IN SAGINAW COUNTY.								
10	Carrollton or Sixth Street	Highway	16.45	72	72	.....	12	Both clear.
11	Pere Marquette Ry	Railway	17.41	62	61	.....	10.5	Do.
	Across bayou west	do.	17.41	53	53	.....	10.5	Not in use.
12	Johnson Street	Highway	17.62	.....	.....	90	14.5	Bascule; clear.
13	Genesee Avenue	Highway ²	18.06	.....	.....	88	17	Double rolling lift; clear.
14	Grand Trunk (C., S. & M.) Ry.	Railway	18.4	72	71	.....	11.9	Both clear.
15	Michigan Central R. R.	do.	18.57	70	70	.....	12.4	Do.
16	Bristol Street	Highway ²	19.03	66	66	.....	14.3	Do.
17	Court Street	Highway	19.73	73	74	.....	12.8	Do.
18	Mackinaw Street	do.	19.97	64	62	.....	10.8	Do.
19	Center Street	do.	20.74	74	74	.....	16.5	Do.
20	Pere Marquette Ry. (Belt line).	Railway	21.02	73	73	.....	14.9	Do.

¹ Right and left refer to sides looking downstream.² Bridge carries electric railway tracks.³ Bridge over west channel only.

Whistle signal for opening draws, 1 long, 2 short, 1 long (— — — — —).

Bridges are lighted according to United States Lighthouse Bureau regulations for lighting bridges.

Navigable tributaries.—The Tittabawassee River is navigable from Green Point to the city of Midland, a distance of 24 miles, for small boats, launches, and flat scows drawing not more than 3 or 4 feet.

The Shiawassee River, near Green Point, has an available depth of 5 to 6 feet, and the crooked channel across Shiawassee Lake is 15 or 16 feet deep in many places. Beyond the lake the Shiawassee River is very narrow and crooked, but is navigable for small boats up to the junction with Bad River, and the Bad River up to the village of St. Charles, which is 13 miles from Green Point.

The Cass and Flint Rivers, which are tributaries of the Shiawassee, are navigable by rowboats to a limited extent, being greatly obstructed by sunken logs and snags.

Directions.—To enter the river from Saginaw Bay, bring the lights in range when 3 miles from the front light and steer in on the range 184° (S. $\frac{1}{2}$ W.) passing between the gas buoy and black spar

buoy at entrance to the cut. Keep on the range until buoys Nos. 15 and 16 have been passed, when change course to 174° (S. $\frac{1}{4}$ E.) (nothing to the eastward until abreast of beacon light). Then follow mid-channel until first drawbridge is reached.

Caution.—The bay near the entrance to the channel and the channel itself are filled with water-logged timbers, and vessels should proceed under slowest possible speed while near or in the channel.

Directions for Saginaw River.—The entrance to the dredged cut across the bar at the mouth of the river is marked by a light buoy and a black spar buoy; the course through it is indicated by range lights.

Bay City is situated on the east bank of the Saginaw River, about 4 miles from Saginaw Bay.

It has an extensive trade in lumber and the manufacture of salt. It also has important fisheries, and some shipbuilding is done. It is connected with West Bay City by several bridges. The population was 47,554 in 1920.

Dry docks.—There are two dry docks, as follows: The Bay City Dry Dock. Length over all, 316 feet; length on blocks, 306 feet; width of gate at top, 62 feet; at bottom, 42 feet; depth over sill, $13\frac{1}{2}$ feet. The James Davidson Dock in West Bay City. Length over all, 435 feet; length on blocks, 400 feet; width of gate at top, 100 feet; at bottom, 60 feet; depth over sill, $14\frac{1}{2}$ feet.

Storm signals.—Day and night signals are displayed at Bay City from a steel tower on the Jennison Hardware Co.'s building, foot of Fifth Street.

Saginaw is situated on the Saginaw River at the head of navigation 13 miles above Bay City. Its site is a plateau elevated about 30 feet above the river, which is crossed by several bridges. The industries are railroad shops, iron, machine, boiler, and plate-glass works, gasoline engines, breweries, automobiles, wooden ware, brick, etc.

It is the center of the beet-sugar industry of the State, and it is engaged in coal mining, lumbering, and the manufacture of salt. Population was 61,903 in 1920.

The shore trends northwesterly from Saginaw River about 11 miles to Nayanquing Point, is slightly concave, and has shoal water extending 3 to 7 miles from it. From Nayanquing Point the coast trends northward for about 11 miles to Saganing River, northeastward for about 6 miles to Wigwam Bay, then eastward for about 7 miles to Point Au Gres and is bordered by shoal water extending from 3 to 8 miles from it throughout.

Point au Gres projects from the west shore about 25 miles north-erly from the mouth of Saginaw River. The bottom is quite shal-

low and rocky to 1 mile off around this point, with 5 fathoms close outside of this limit. In the bight about $6\frac{1}{2}$ miles wide between Point au Gres and Gravelly Point or Point Lookout a sandy and stony flat has a maximum extent of about 2 miles, in the vicinity of the mouth of Au Gres River.

At Point Lookout (Gravelly Point) a shoal with depths of 9 to 15 feet extends over $2\frac{1}{2}$ miles east-southeastward, with a detached 16-foot spot south of its outer end and $2\frac{5}{8}$ miles 132° (SE.) from the point. This shoal is of importance because it restricts the available deep water between it and the Charity Islands for vessels making the Saginaw River. There is protection from northerly and westerly winds and holding ground in 4 to 5 fathoms, mud bottom, close under Point Lookout, but this area is obstructed by fish-net stakes.

Gravelly Point Shoal Light and Bell Buoy.—A red conical buoy with a skeleton superstructure and showing an occulting red light is moored in 24 feet on the end of the shoal extending southeastward from Point Lookout.

Fog signal.—The fog signal is made on a bell sounded by the motion of the waves.

Whitestone Point lies 4 miles northward of Point Lookout. The shore between is concave and has shoal water extending about $1\frac{1}{4}$ miles from it. There is a 5-foot shoal $\frac{3}{4}$ mile southeastward of Whitestone Point.

Alabaster, about midway between Whitestone Point and Tawas Bay, has shoal water with 11 feet extending out about 1 mile off Alabaster Dock.

Tawas Bay, about 4 miles wide and facing the south, is formed by Tawas Point, inclosing it on the east, and the curving mainland on the north and west. It is an excellent harbor, affording secure anchorage in all winds except from the southwest.

The 20-foot curve lies about $1\frac{1}{4}$ miles from the western shore, 1,100 yards from the northern shore, and about 880 yards from the eastern shore, leaving an area about $1\frac{1}{4}$ miles long and 880 yards wide with depths varying from $3\frac{3}{4}$ to $4\frac{1}{2}$ fathoms except for a small strip extending across the middle, which has a depth of 20 feet.

Tawas Light, occulting white with a red sector, 70 feet above water, visible 16 miles, is shown from a white, conical tower, with a dwelling attached, on Tawas Point. (See Light List.)

Fog signal.—The fog signal is made on a steam whistle.

Tawas Point Light Buoy No. 6.—A red conical buoy with a skeleton superstructure, and showing an occulting white light, is moored, in 33 feet, on the end of the shoal, $1\frac{1}{4}$ miles 230° (SW. $\frac{3}{4}$ W.) from Tawas Light.

Buoy.—A red spar buoy moored in 16 feet, about 1 mile 303° (NW. $\frac{3}{4}$ W.) from Tawas Light, marks the northwestern point of the shoal extending from Tawas Point.

Anchorage.—At the head of the bay there is an excellent harbor protected by Tawas Point affording secure anchorage in $3\frac{1}{2}$ to 4 fathoms protected from all winds, excepting those from the south.

The docks at Tawas City (the county seat of Iosco County) and at East Tawas are in ruins. At Tawas Beach, on the northeasterly shore of the bay, there is a dock with $13\frac{1}{2}$ feet of water.

Directions, Tawas Bay.—Vessels from the northward and eastward should pass to southward of the light buoy, heading 292° (NW. by W. $\frac{3}{4}$ W.). When the buoy comes in range with Tawas Light, 50° (NE. $\frac{3}{4}$ E.), haul up to 0° (N. $\frac{1}{4}$ E.), and when Tawas Light bears 112° (SE. by E. $\frac{3}{4}$ E.) change course to 54° (NE. by E. $\frac{1}{8}$ E.), and anchor in about 4 fathoms over sand and clay, about 1 mile 337° (N. by W. $\frac{3}{4}$ W.) from Tawas Light. From the eastward vessels should enter the red sector of Tawas Light just before the turn at the light buoy. To enter the harbor from Saginaw Bay, steer 7° (N. $\frac{1}{8}$ E.) from a position $5\frac{3}{4}$ miles 330° (NNW. $\frac{3}{8}$ W.) from Charity Island Lighthouse, when the Tawas Point Light Buoy and Tawas Light are in range bearing 50° (NE. $\frac{3}{4}$ E.) proceed as instructed above.

Tawas City is situated on the western shore of Tawas Bay. It has a dock, with 7 feet of water, with lumber interests. Population, 1,200.

East Tawas, situated on the north shore of Tawas Bay, $1\frac{1}{4}$ miles above Tawas City. It has important fishing interests, lumber mills, salt works, and the production of evaporated vegetables. Population, about 1,800.

Coast-guard station is located about $\frac{1}{8}$ mile 56° (NE. by E. $\frac{1}{4}$ E.) from the lighthouse.

Storm warnings.—Day and night signals are displayed from a steel tower on the lake side of Tawas Point, 150 feet southwest of the Coast-guard station.

Shore.—From Tawas Point to Au Sable (Fish) Point the shore is obstructed by shoals and submerged net stakes, and should be given a berth of $1\frac{1}{2}$ miles. There is shoal water extending $1\frac{1}{4}$ miles around Au Sable Point. Under this point there is good holding ground and protection from winds from north to west.

Au Sable Point Light and Bell Buoy 5A.—A black conical buoy with a skeleton superstructure and showing an occulting white light is moored in 40 feet outside the shoal of the point.

Fog signal.—The fog signal is made on a bell sounded by the action of the waves.

Au Sable.—The shore between Au Sable Point and Au Sable is unsafe to approach nearer than 3 miles on account of foul ground.

Au Sable, on the west shore of Lake Huron north of Saginaw Bay, at the mouth of the Au Sable River. There used to be a 10-foot channel from the mouth of the river to the swing bridge, but the channel has now filled up to 3 or 4 feet. Shipments from the port are principally made from private piers, built out into the lake outside the mouth of the river.

It has several large lumber mills. Population, about 1,500.

Shoal.—A shoal with 10 to 12 feet on it extends in a northeasterly direction from 2 miles below the mouth of the Au Sable River to a point over 1 mile east of Au Sable Pierhead Light.

Au Sable Pierhead Light, flashing red, 34 feet above water, visible 10 miles, is shown from a white pyramidal, skeleton tower on side of north pier at the mouth of the Au Sable River.

Oscoda, a village directly north of and adjoining Au Sable. The harbor is an open roadstead with a good dock, at which all shore steamers stop.

The principal industries are lumber, laths, and shingles. Population, about 1,500.

Storm signal station.—Day and night storm warning signals are displayed from a flagstaff on the Union Steamboat Dock on the harbor front. Oil lights are used at night.

Coast.—The coast from Au Sable to Sturgeon Point has a number of rocky shoals with about 14 feet of water over them and extending out nearly 2 miles from shore.

A detached shoal lies with its northern end 2 miles south of Harrisville extending about 1 mile north and south and 660 yards in width. There is a 14-foot spot about 1 mile south of Harrisville and 1 mile offshore.

Sturgeon Point Light, flashing white, 69 feet above water, visible 16 miles, is shown from a white conical tower, with a dwelling attached, on the easternmost point between Saginaw and Thunder Bays.

Coast.—Between Sturgeon Point and South Point, about 12 miles, rocky shoals extend from 1 to 1½ miles, with from 11 to 15 feet on them, especially off the mouth of the Black River. Foul ground extends from the shore to Black River Island. All along the above distance the shore should not be approached within 2 miles.

Thunder Bay.—Next to Saginaw Bay, Thunder Bay is the most prominent indentation on the west shore of Lake Huron. The extreme points are North Point and South Point 10 miles apart, and the distance northwesterly to the mouth of Thunder Bay River from a line joining these two points is about 9 miles.

The bay affords shelter in all but southeasterly gales, and good holding ground is found generally under the shores. The north

shore from Whitefish Point to North Point affords a good lee in heavy northeast gales, in depths of 4 to 5 fathoms, close to shore, with clay and sand bottom.

The southwestern shore for about $5\frac{1}{2}$ miles from South Point to Ossineke is filled with shoals and flats; the shoal water extends from South Point about $2\frac{1}{2}$ miles northward to a point about $\frac{1}{2}$ mile beyond Scare Crow Island, thence curving and extending about west by north toward the mainland.

From about 1 mile northerly of Ossineke to the vicinity of Sulphur Island there are depths of 18 feet to within $\frac{1}{2}$ mile of the shore. Sandy flats with less than 14 feet of water connect Sulphur Island with the mainland at Squaw Bay, and a stony shoal with 2 feet on its outer portion extends 1 mile northward from the island, to abreast of Partridge Point. Detached stony patches with $9\frac{1}{2}$ to 13 feet depths lie $1\frac{1}{2}$ miles east and $1\frac{1}{2}$ miles southeast of the island. Between Partridge Point and the mouth of Thunder Bay River the coast abounds in detached lumps; the most easterly, with 6 feet least depth, lies $1\frac{1}{2}$ miles northeastward from Partridge Point and $1\frac{1}{2}$ miles from the shore to the west; another, with least depth of 9 feet, lies $1\frac{1}{2}$ miles southeastward from the harbor light. There are also many submerged net stakes in the deeper water within 2 miles to the east and northeast of Partridge Point.

Radio compass station.—The United States naval communication service will erect a radio compass station at Thunder Bay.

The northern shore of the bay from Whitefish Bay (which is quite shallow) to North Point may be safely approached to within 1 mile, but at North Point a shoal sets out for $1\frac{1}{2}$ miles in a southeasterly direction, with only 8 feet of water near the outer end.

Wreck—Buoy.—A red spar buoy is moored $1\frac{1}{2}$ miles 251° (WSW. $\frac{1}{2}$ W.) from the southern tangent of North Point. It marks the position of a wreck.

Islands.—**Bird Islands** are located 1,540 yards 310° (NW. $\frac{1}{2}$ W.) from the northeastern extremity of South Point. They derive their name from the resemblance to a bird.

Scare Crow Island is very irregular and has depths from 1 to 4 feet around it. It lies $2\frac{1}{2}$ miles 340° (N. by W. $\frac{3}{4}$ W.) from the northeastern extremity of South Point.

Sulphur Island, 1,100 yards long northwest and southeast and 880 yards wide, lies about $1\frac{1}{2}$ miles 140° (SE. $\frac{1}{2}$ S.) from Partridge Point, the northern limit of Squaw Bay.

Grass Island, about $\frac{1}{2}$ mile long and $\frac{1}{2}$ mile wide, lies 2 miles 348° (N. $\frac{1}{4}$ W.) from Partridge Point.

Ossineke is a village at the mouth of the Devil River.

Alpena Harbor, Mich., lies on the northwestern shore of Thunder Bay and is formed by the lower reach of Thunder Bay River and its junction with the bay.

Alpena Light, occulting white, 42 feet above water, visible 14 miles, is shown from a black, rectangular, skeleton tower, on the northern side of the entrance to Thunder Bay River.

Fog signal.—The fog signal is made on a siren.

Channel.—The total length of the channel which has been improved to project depth is about $1\frac{1}{2}$ miles, comprising an approach a little over 880 yards long in Thunder Bay and a river channel 1,540 yards long. At the river mouth there are slab piers, held in place by piles of rock, and extending upstream from the bay shore there are slab revetments, which have been neglected since the closing of the lumber mills. During recent years these revetments have been deteriorating rapidly and the slabs have washed into the channel along its sides.

An examination made in August, 1920, showed channel depths of $16\frac{1}{2}$ feet, for a width of 80 feet to a point 1,200 feet above the lighthouse and a depth of 13 feet for a width of 100 feet.

Fluctuations of water surface.—Each year the level of Thunder Bay River rises and falls about $3\frac{1}{2}$ feet. From day to day the level changes somewhat, due to wind and barometric pressure, such changes frequently amounting to more than 1 foot. Occasionally a considerable oscillation takes place within a few hours, due to violent northerly or southerly winds.

Bridge.—A high way bridge spans the river at Second Avenue, about 880 yards above the mouth. It is a draw span on a center pier, with two openings 60 feet wide in the clear, both of which are used for passage of vessels; the clear headroom is $10\frac{1}{2}$ feet. Signal for opening draw, 3 blasts (— — —); a bell on the bridge sounds return signals. The bridge is lighted according to United States Lighthouse Bureau regulations.

Harbor rules and regulations.—There are no special rules prescribed by the United States, but the city of Alpena employs a harbor master who has authority to regulate the movement and location of vessels so as to prevent unnecessary obstruction to navigation in the harbor.

Docks.—The Huron Portland Cement Co. docks are situated 1,540 yards northeasterly of Alpena Light. The outer dock lies in a northeasterly and southwesterly direction and is connected with the shore at the northerly end, forming a protection from the east to a slip running 700 feet in a northwesterly direction, and from 104 to 150 feet in width. A cement warehouse is situated on the easterly side and a stone elevator on the westerly side of the slip.

shore from Whitefish Point to North Point affords a good lee in heavy northeast gales, in depths of 4 to 5 fathoms, close to shore, with clay and sand bottom.

The southwestern shore for about $5\frac{1}{2}$ miles from South Point to Ossineke is filled with shoals and flats; the shoal water extends from South Point about $2\frac{1}{2}$ miles northward to a point about $\frac{1}{2}$ mile beyond Scare Crow Island, thence curving and extending about west by north toward the mainland.

From about 1 mile northerly of Ossineke to the vicinity of Sulphur Island there are depths of 18 feet to within $\frac{1}{2}$ mile of the shore. Sandy flats with less than 14 feet of water connect Sulphur Island with the mainland at Squaw Bay, and a stony shoal with 2 feet on its outer portion extends 1 mile northward from the island, to abreast of Partridge Point. Detached stony patches with $9\frac{1}{2}$ to 13 feet depths lie $1\frac{1}{8}$ miles east and $1\frac{1}{8}$ miles southeast of the island. Between Partridge Point and the mouth of Thunder Bay River the coast abounds in detached lumps; the most easterly, with 6 feet least depth, lies $1\frac{1}{2}$ miles northeastward from Partridge Point and $1\frac{1}{4}$ miles from the shore to the west; another, with least depth of 9 feet, lies $1\frac{1}{4}$ miles southeastward from the harbor light. There are also many submerged net stakes in the deeper water within 2 miles to the east and northeast of Partridge Point.

Radio compass station.—The United States naval communication service will erect a radio compass station at Thunder Bay.

The northern shore of the bay from Whitefish Bay (which is quite shallow) to North Point may be safely approached to within 1 mile, but at North Point a shoal sets out for $1\frac{1}{4}$ miles in a southeasterly direction, with only 8 feet of water near the outer end.

Wreck—Buoy.—A red spar buoy is moored $1\frac{1}{2}$ miles 251° (WSW. $\frac{1}{2}$ W.) from the southern tangent of North Point. It marks the position of a wreck.

Islands.—**Bird Islands** are located 1,540 yards 310° (NW. $\frac{1}{2}$ W.) from the northeastern extremity of South Point. They derive their name from the resemblance to a bird.

Scare Crow Island is very irregular and has depths from 1 to 4 feet around it. It lies $2\frac{1}{4}$ miles 340° (N. by W. $\frac{3}{4}$ W.) from the northeastern extremity of South Point.

Sulphur Island, 1,100 yards long northwest and southeast and 880 yards wide, lies about $1\frac{1}{4}$ miles 140° (SE. $\frac{1}{4}$ S.) from Partridge Point, the northern limit of Squaw Bay.

Grass Island, about $\frac{1}{4}$ mile long and $\frac{1}{8}$ mile wide, lies 2 miles 348° (N. $\frac{1}{4}$ W.) from Partridge Point.

Ossineke is a village at the mouth of the Devil River.

Alpena Harbor, Mich., lies on the northwestern shore of Thunder Bay and is formed by the lower reach of Thunder Bay River and its junction with the bay.

Alpena Light, occulting white, 42 feet above water, visible 14 miles, is shown from a black, rectangular, skeleton tower, on the northern side of the entrance to Thunder Bay River.

Fog signal.—The fog signal is made on a siren.

Channel.—The total length of the channel which has been improved to project depth is about $1\frac{3}{4}$ miles, comprising an approach a little over 880 yards long in Thunder Bay and a river channel 1,540 yards long. At the river mouth there are slab piers, held in place by piles of rock, and extending upstream from the bay shore there are slab revetments, which have been neglected since the closing of the lumber mills. During recent years these revetments have been deteriorating rapidly and the slabs have washed into the channel along its sides.

An examination made in August, 1920, showed channel depths of $16\frac{1}{2}$ feet, for a width of 80 feet to a point 1,200 feet above the lighthouse and a depth of 13 feet for a width of 100 feet.

Fluctuations of water surface.—Each year the level of Thunder Bay River rises and falls about $3\frac{1}{2}$ feet. From day to day the level changes somewhat, due to wind and barometric pressure, such changes frequently amounting to more than 1 foot. Occasionally a considerable oscillation takes place within a few hours, due to violent northerly or southerly winds.

Bridge.—A high way bridge spans the river at Second Avenue, about 880 yards above the mouth. It is a draw span on a center pier, with two openings 60 feet wide in the clear, both of which are used for passage of vessels; the clear headroom is $10\frac{1}{2}$ feet. Signal for opening draw, 3 blasts (— — —); a bell on the bridge sounds return signals. The bridge is lighted according to United States Lighthouse Bureau regulations.

Harbor rules and regulations.—There are no special rules prescribed by the United States, but the city of Alpena employs a harbor master who has authority to regulate the movement and location of vessels so as to prevent unnecessary obstruction to navigation in the harbor.

Docks.—The Huron Portland Cement Co. docks are situated 1,540 yards northeasterly of Alpena Light. The outer dock lies in a northeasterly and southwesterly direction and is connected with the shore at the northerly end, forming a protection from the east to a slip running 700 feet in a northwesterly direction, and from 104 to 150 feet in width. A cement warehouse is situated on the easterly side and a stone elevator on the westerly side of the slip.

The approach from deep water in Thunder Bay is 344° (N. by W.) through a dredged channel 100 feet wide. At a point 500 feet outside of the outer dock the channel gradually widens and is 500 feet wide abreast of the southerly end of that dock. The channel and slip have been dredged to 18 feet. To reach the slip vessels pass to westward of the range, around the end of the outer dock.

Range Lights—Front Light.—A fixed red light, 40 feet above water, is shown from a pole on the southern end of the outer dock.

Bear Light.—A fixed red light, 60 feet above water, is shown from a pole 420 yards 343° (N. by W. $\frac{1}{2}$ W.) from the front light.

These in range lead through the channel up to the docks.

Light buoy.—A black spar-shaped buoy, showing an occulting white light, is moored in 18 feet on the western side of the outer end of the channel.

A red spar buoy marks the eastern side.

Directions.—To enter, get the light tower to bear 305° (NW. $\frac{1}{2}$ W.), and, leaving it on the starboard hand, steer through the center of the river between the lumber docks.

Alpena has foundries, saw, planing, woolen, and flour mills, Portland cement works, etc. It has extensive fisheries and is a summer resort and has large lumber-shipping interests. Population, 12,000.

Storm warnings.—Day and night signals are displayed from a steel tower in rear of the Federal Building.

A radio station is operated all the year by the United States Navy; after close of navigation station is not open from 8 p. m. to 8 a. m.; call letters NSM; working distance, 150 miles.

North Point is the southern extremity of the peninsula which forms the eastern side of Thunder Bay. Shoal water extends $1\frac{3}{4}$ miles southeasterly from it.

North Point Light and Bell Buoy.—A red, conical buoy, with a skeleton superstructure and showing an occulting white light, is moored in 22 feet on the end of the shoal extending southeastward from North Point. Shoal water extends 880 yards from the eastern shore.

Fog signal.—The fog signal is made on a bell sounded by the action of the waves.

Caution.—All vessels should pass to southward of this buoy.

Thunder Bay Island, $1\frac{1}{2}$ miles long northwest and southeast and 660 yards wide at the widest part, is situated 3 miles east-northeast of North Point. There is a harbor of limited capacity between Sugar Island and Thunder Bay Island, with maximum depth of 12 feet, good holding ground, and protection from east, northeast, and northwest winds. The entrance is from the south; it is not safe for a stranger to enter from the north. The holding ground on the south of Sugar Island and on the southwest of Thunder Bay

Island is not good, the bottom being rocky and stony. Spits extend 1,000 feet southeast from Thunder Bay Island. The area between the island and the mainland is shoal and rocky.

Thunder Bay Island Light, flashing white, 63 feet above water, visible 16 miles, is shown from a yellow, conical tower, with a dwelling attached, on the eastern shore of the island. All vessels should pass to eastward of this light.

Fog signal.—The fog signal is made on a steam whistle.

Telegraph cable.—There is a telegraph cable connecting the island with the mainland.

Coast-guard station.—A coast-guard station is located on the southwest side of Thunder Bay Island.

Storm-warning station.—Day and night storm-warning signals are displayed from a steel tower on the southeastern end of the island.

Sugar Island lies about 1,100 yards westward of Thunder Bay Island. It is about 1,540 yards in diameter and very irregular in shape.

Gull Island, 660 yards long east and west and 440 yards wide, lies 880 yards northwestward of Sugar Island.

Shore.—From North Point the shore trends northwestward for 12 miles to Monaghan Bay abreast Middle Island. It is very irregular throughout and is fronted by shoal water extending from 1,320 yards to 4 miles from it.

Large vessels should give this shore a berth of at least 1 mile.

Middle Island is situated $1\frac{1}{2}$ miles from the mainland, and 5 miles southeast of False Presque Isle Harbor. It is 1,540 yards long northwesterly and southeast, and 1,100 yards wide.

There is a shoal midway between Middle Island and the mainland with a least depth of $6\frac{1}{2}$ feet, and other patches with depths of 10 to 12 feet make this passage dangerous for strangers. A rocky shoal with a depth of 2 feet lies 1,000 yards 112° (SE. by E. $\frac{1}{2}$ E.) from the southeast point of Middle Island. Flats extend 880 yards south of the south point of Middle Island, and for about 1 mile off the southwestern side and 400 to 700 yards off the northwestern side of the island.

Middle Island Light, fixed red, 78 feet above water, visible 17 miles, is shown from a buff, conical tower, with a dwelling attached, on the eastern side of the island.

Fog signal.—The fog signal is made on a steam whistle.

Buoy.—A red nun buoy marks the southeastern edge of the shoal extending southeasterly from the southeastern point of the island.

Anchorage.—To the southwestward of the island there is fair holding ground in clay and boulders and protection from winds from south through west to northeast. To the northwestward of the island

there is good holding ground in mud and sand and protection from southeast winds. In using these anchorages the island should be given a proper berth to avoid the adjacent shoals.

Coast-guard station.—There is a coast-guard station on the north point of the island.

Storm signals.—Day and night storm-warning signals are displayed from a steel tower 400 feet northeastward of the coast-guard station.

Rockport, located about 2 miles westerly from Middle Island and about $3\frac{1}{2}$ miles southerly from False Presque Isle, is the private harbor of the Great Lakes Stone & Lime Co. There is a dredged channel 200 feet wide and 22 feet deep from deep water to the shore, and a breakwater, docks, and permanent buildings. The plant is equipped for handling large quantities of limestone, the shipping of which was commenced in 1914. The docks are so situated and sheltered that they afford perfect protection from all winds.

False Presque Isle Harbor, about 18 miles northwest of North Point of Thunder Bay and about 6 miles southeast of Presque Isle Harbor, is a protected area lying under the south side of Presque Isle, a nearly detached body of land projecting about $1\frac{1}{2}$ miles east from the main shore. This is a secure harbor for winds from southwest around through north to northeast, with fair anchorage in 4 and 5 fathoms. From the point at the southwest side of the harbor flats and detached shoals extend southeasterly for $2\frac{1}{2}$ miles; the most easterly patch, with 11 feet, is $1\frac{1}{2}$ miles east from the adjacent shore, with other spots of 9 and 10 feet close inside it. Directly in the harbor approach, about 1,540 yards southeast of the southeasterly point of Presque Isle, there is a rocky shoal with 19 feet of water over it.

Directions—False Presque Isle Harbor.—Stand in on a 315° (NW. $\frac{3}{4}$ N.) course, keeping 590 yards from the north shore of the harbor, and anchor in about 3 fathoms; or smaller craft will find a snug berth farther in, in $2\frac{1}{2}$ fathoms. Good shelter is found here from all winds excepting those between south and east.

Coast.—From False Presque Isle to the northern point of Presque Isle the coast trends in a general northwest direction. The water is deep, from 440 to 660 yards offshore up to the bight just below Presque Isle Harbor; this bight is very shallow.

Presque Isle Harbor is a bay about 1,180 yards across at its entrance between the mainland point on the south and the southerly end of Presque Isle Peninsula on the north, with shore indention of about 1,320 yards within this line. It affords a safe but limited harbor and an anchorage for small vessels in 3 and $3\frac{1}{2}$ fathoms. A bar across the entrance limits the draft in entering the harbor; vessels

can carry about 12 feet on the range line. Inside the bar there is an area of about 60 acres with a depth of 14 to 20 feet.

Shoal.—A $6\frac{1}{2}$ -foot shoal lies 1,000 yards 98° (ESE. $\frac{3}{4}$ E.) from the old lighthouse, with a depth of 15 feet extending 600 feet south-eastward.

Presque Isle Light, fixed white, 123 feet above water, visible 20 miles, is shown from a white conical tower with a dwelling attached on the northern end of the isle. This light marks the turning point for the Straits of Mackinac.

Fog signal.—The fog signal is made on a steam whistle.

Storm-warning signals.—Day and night signals are displayed from a steel tower on the point, 300 feet east of the lighthouse.

Range lights—Front Light.—A fixed white light, 18 feet above water, visible 10 miles, is shown from a white square tower on the western shore of the harbor.

Rear Light.—A fixed white light, 36 feet above water, visible 10 miles, is shown from a white square tower on a dwelling 317 yards 274° (W. $\frac{3}{4}$ N.) from the front light.

These in range bearing 274° (W. $\frac{3}{4}$ N.) lead into the harbor.

Directions.—When in 7 fathoms of water and about 1 mile 111° (SE. by E. $\frac{3}{4}$ E.) from the old lighthouse on the southern end of Presque Isle, stand in on the range 274° (W. $\frac{3}{4}$ N.) until the old lighthouse bears 22° (NNE. $\frac{3}{4}$ E.), when haul up a short distance northward or southward of the range line and anchor in 3 or $3\frac{1}{2}$ fathoms.

The south entrance point should be given a good berth on account of a spit extending northerly from it.

North Bay, about $1\frac{1}{2}$ miles long to its head, lies west of and is protected by Presque Isle Peninsula; it affords shelter and anchorage in easterly and southerly winds, but the bottom is rock. The western side of the peninsula should be given a berth of 590 yards, and the westerly bay shore opposite a berth of about 440 yards. A shoal with $16\frac{1}{2}$ feet lies about in the middle of the bay, and the prevailing depths range upward to 30 feet. The rear light of the Presque Isle Range is opened out as a guide into North Bay, and this harbor is used in southeasterly and easterly gales. Vessels entering the bay on a $157^\circ 30'$ (S. by E. $\frac{3}{4}$ E.) course, heading for the above light, will find deep water to within 590 yards of the head of the bay.

Shore.—Black Point, on the western side of North Bay and about 2 miles from Presque Isle Light, may be approached within 440 yards. Thompsons Harbor, 2 miles west of Black Point, is available only for small craft drawing 4 feet of water; strangers should enter slowly and keep near the easterly side, to avoid several submerged bowlders lying from 880 yards out to near the entrance. Two miles 104° (ESE. $\frac{3}{4}$ E.) from Adams Point, which is 11 miles 292° (NW.

by W. $\frac{1}{2}$ W.) from Presque Isle, there is a detached shoal with least depth of 18 feet. As the foul ground extends from shore to within 880 yards of this shoal, coasting vessels, from abreast of Little Trout River (marked by a thick mound-shaped patch of woods), should keep north of a line with Adams Point bearing west. The coast from Adams Point $3\frac{1}{2}$ miles westerly to Calcite can be approached generally to within 880 yards.

Calcite is located about $1\frac{1}{2}$ miles east of Rogers, near and including the old Crawford Quarry Dock property. A breakwater extends from the shore out to a depth of 24 feet, and a dredged channel 21 feet deep runs southward of the breakwater, which affords shelter from nearly all storms. A channel 25 feet deep and 260 feet wide was dredged in 1915.

Light buoy.—A black buoy showing a red light is moored on the south side of the approach, about 1,100 feet outside of the breakwater.

Dock.—A dock and large steel buildings of a permanent character have been erected for the storage and conveying of crushed limestone, which has developed into an important industry.

The Michigan Limestone & Chemical Co. has a permit from the Government authorizing extension of the present (north) breakwater, construction of a breakwater on the southerly side of the harbor, and filling in of the water areas adjacent to the harbor structures. When completed there will be an inclosed harbor with an entrance 300 feet wide.

Rogers, the county seat of Presque Isle County, is situated $4\frac{3}{4}$ miles west of Adams Point and about a mile east of the mouth of Trout River, which empties into the lake about $5\frac{3}{4}$ miles southeasterly from Forty Mile Point. It has saw and planing mil's, telephone connection, and a station of the Detroit & Mackinac Railroad.

The port is an open roadstead with no natural harbor. There are three docks, each about 600 feet long, extending in a northeasterly direction, with 8 to 14 feet of water alongside, and one dock about 500 feet long for fishing tugs and small boats. The approach was formerly obstructed by a bar about 300 feet outside of the docks and running parallel to the shore, with least depth of 10 feet. There is a channel 130 feet wide across the bar which has a controlling depth of $14\frac{1}{2}$ feet. It is marked by two red and one black spar buoys.

Forty Mile Point lies about 22 miles northwestward of Presque Isle Light.

Forty Mile Point Light, occulting white, 66 feet above water, visible 16 miles, is shown from a red, square, brick tower on the point.

Fog signal.—The fog signal is made on a steam whistle.

Shore—Forty Mile Point to Cheboygan Light.—At $1\frac{1}{2}$ miles westerly from Forty Mile Point Light a sand and gravel spit, with depth of $20\frac{1}{2}$ feet, extends 1,320 yards from the shore in a north-easterly direction. With this exception the shore between the light and the east point of Hammond Bay, $6\frac{1}{2}$ miles westerly, may be approached within 880 yards. At Spens Mill Dock, 4 miles westerly from Forty Mile Point, there is only 5 or 6 feet of water at the outer end and vessels are loaded from rafts.

Hammond Bay is about 6 miles long between its southeast and northwest points, with indention inshore of about 2 miles. It affords shelter in all winds from southeast through south to northwest, with fair anchorage in 4 and 5 fathoms off the mouth of Ocqueoc River, which empties into the south side of the bay. A boulder shoal with about 16 feet of water extends 660 yards from the shore at the Coast-Guard station. From the station to about 1 mile southerly of Grace Dock (at the northwest end of the bay), there are numerous submerged net stakes for 1 mile offshore.

Coast-guard station is located on the east point of Hammond Bay; it has telephone and stage connections.

Grace is a village with a sawmill, telephone connection, and a post office. The dock extends 800 feet in a 78° (E. $\frac{1}{4}$ N.) direction, with 9 to 12 feet at the outer end. Strangers should bring the end of the dock and the sawmill in range to avoid shoal water east of the end of the dock. A shoal with depths under 18 feet extends 1 mile southeast of the dock, its outer end being 1,320 yards offshore.

Hammond Bay to Cheboygan Light.—For 5 miles northwesterly from Grace, or to within 2 miles of Nine Mile Point, vessels should keep at least 1,320 yards from shore to avoid the dangerous rocky shoals. In the vicinity of Nine Mile Point and thence to Nordberg Mill $3\frac{1}{2}$ miles westerly, the shore may be approached to within $\frac{1}{2}$ mile. Northeasterly off Cordwood Point, within $1\frac{1}{2}$ miles, there are several detached shoals with depths of 21 to 22 feet, dangerous to large vessels entering the South Channel of the Straits of Mackinac. Between Cordwood Point and Cheboygan Light a berth of 1,320 yards should be given.

Nine Mile Point marks the turning point into South Channel to the Straits of Mackinac.

Spectacle Reef lies about 10 miles 22° (NNE. $\frac{3}{4}$ E.) from Nine Mile Point. It is about 1,540 yards long north and south and about 440 yards east and west and has a least depth of 7 feet. The soundings are irregular near the reef, with 5 and 12 fathoms close-to.

Spectacle Reef Light, alternating flashing white and red, 86 feet above water, visible 17 miles, is shown from a gray conical tower on the western edge of the reef.

Fog signal.—The fog signal is made on a steam whistle.

Buoy.—A red nun buoy is moored in 20 feet about 880 yards 169° (S. $\frac{1}{2}$ E.) from the light to mark the southern end of Spectacle Reef.

Raynolds Reef lies about $3\frac{1}{2}$ miles 278° (WNW. $\frac{1}{2}$ W.) of Spectacle Reef Light. It has a least depth of 12 feet.

Buoy.—A red and black horizontally striped can buoy is moored in 20 feet of water to mark the northern edge of the reef, which should not be approached nearer than 220 yards.

The description and directions for the Straits of Mackinac are given in Chapter XV.

CHAPTER IV.

LAKE HURON—EASTERN SHORE—POINT EDWARD TO CAPE HURD.

The low water of 1895 (579 feet above mean tide at New York) was $1\frac{1}{2}$ feet below the datum used for this chapter.

Harris Point.—From the entrance to St. Clair River the low thinly wooded Canadian sand beach trends in an east-northeasterly direction nearly 14 miles, being fronted by a sand bank about 400 yards in width. Thence, the shore turns north-northeastward for 2 miles to Harris Point, the bay thus formed being fronted by a sand bank with 12 to 16 feet over it, having a maximum width of 1,320 yards. From Harris Point the bank extends nearly 880 yards.

Kettle Point (Cape Ipperwash).—From Harris Point the shore, now changed from sand to stones, trends in a northeast direction $8\frac{1}{2}$ miles, the last 5 miles being fronted by a very shallow bank extending off 1 mile. Hence, the shore of this foul bay trends northward 3 miles with the same extensive bank to Kettle Point. The latter is a very decided wooded projection, low and fringed with boulders and reefs.

The bight eastward of this point gives shelter in winds from southwest through south to east.

Kettle Point Reef.—From the north end of the point a shallow reef extends north $1\frac{1}{2}$ miles to a depth of 18 feet, northwest 2 miles and westward the same distance. The bank inside this limit is very shallow.

Stony Point.—From Kettle Point (Cape Ipperwash) the stony shore trends eastward 3 miles to Stony Point, composed of solid rock and fringed with boulders. From the shore nearly 1 mile east-northeastward of Stony Point a spur makes out nearly 1,320 yards to a depth of 15 feet over boulders.

Mouth of Ausable River.—This unimportant shallow stream, after paralleling the beach for 8 miles from Grand Bend, takes a turn and approaches the shore till it breaks through at a point 5 miles eastward of Kettle Point (Cape Ipperwash). Only 1 foot water can be carried over the sandy bar, and even this depth can not be found beyond 1 mile up.

Grand Bend is situated 9.3 miles northeastward of the mouth of Ausable River. The beach from Stony Point to Grand Bend is composed of fine sand, backed by a thin growth of stunted pines,

and sand dunes, which show up in the afternoon with the sun shining on them. The sandy shore is fronted by a clean sandy bank a little under 880 yards wide. A group of conspicuous summer cottages will be seen on the beach $1\frac{1}{4}$ miles northward of Grand Bend.

Grand Bend is so called from a sharp turn in the Ausable River, which, in its course to the lake, flows nearly north till it reaches within 700 yards of the south end of the clay bank. It then, as before stated, turns suddenly and follows the shore at a distance of 880 yards for 8 miles before breaking through the beach. At Grand Bend an artificial cut has been made through to the lake, and here a cribwork wharf 648 feet long and 20 feet wide is erected to afford a harbor of refuge for boats, but the entrance to the cut is frequently blocked and requires repeated dredging.

Dewey Point.—From Grand Bend the shore trends in a general north-northeast direction 8 miles to Dewey Point, the shore between forming a gradually rounding bay about 1 mile deep. About 880 yards northeastward of Grand Bend a clay bank rises, and, with gradually increasing height, surmounts the shore to and beyond Dewey Point.

Cantin Shoal is a dangerous pile of bowlders with only 10 feet water on it lying over 1,320 yards from the shore 3.3 miles north-northeastward of the canal at Grand Bend. Between it and St. Joseph are three other spots with 18 feet over them.

St. Joseph.—Several very large white brick buildings intended for stores and hotels may be seen on the hill about 1 mile southward of Dewey Point. This is St. Joseph, which has a wharf, but, beyond the buildings, there is no town. The bank off St. Joseph is over 590 yards wide and very foul.

The shore bank from Grand Bend to St. Joseph is 440 yards wide, and composed of sand and bowlders.

A shoal with 17 feet water over it, lies 2 miles southward from Dewey Point, nearly 1,180 yards from the nearest land, and 440 yards outside the shore bank.

Bayfield.—From Dewey Point the shore runs straight in a northerly direction $9\frac{1}{4}$ miles to the mouth of Bayfield River. Surmounting the sand and boulder beach is the usual clay bank about 50 feet high, backed by farms and farmhouses. The shore bank, 440 to over 590 yards wide, is very foul, the bottom being covered with large bowlders.

The harbor, at the mouth of the river, is formed by two piers. The south pier is about 820 feet long, its outer end extending about 120 feet beyond the shore line adjoining the north pier. The north pier extends about 200 feet beyond the shore line, the outer 156 feet being turned to the southwest and forming a sort of outer basin

facing the southwest. Boats can draw about 8 feet at the entrance to the piers and in a channel 70 feet wide in the harbor along the south pier, extending to its easterly end. There are no lights.

Storm-warning signals are displayed from a mast on the south bank overlooking the harbor and the lake.

Village.—From the offing very little can be seen of the village, but a few houses closer together than usual will point out the locality.

Blacks Point.—The shore from Bayfield to Blacks Point trends almost straight in a northerly direction $8\frac{1}{2}$ miles and is fringed with shallow water for an average distance of 880 yards, but 1,320 yards westward of a small point situated $4\frac{1}{2}$ miles north-northward of the mouth of Bayfield Harbor is a rock with 18 feet water over it. Another spot with the same depth over it lies 880 yards off the shore $1\frac{1}{2}$ miles north of the same. The whole shore between Bayfield and Goderich is surmounted by a clay bank about 75 feet high, and a few farm buildings show on it. Blacks Point is not very prominent, but the trees on it are of a much darker shade than the surrounding ones; off it a spit makes out in a northwest direction a little over 880 yards.

A rock with 18 feet over it lies 1,180 yards westward from the mouth of Bayfield Harbor. The bank off the mouth is rocky and uneven but only 590 yards wide, while opposite the south edge of the village the bank is 1,180 yards wide with only 15 feet at the outer edge.

Goderich Harbor is an artificially formed one at the mouth of Maitland River, situated 3.3 miles northward of Blacks Point and $62\frac{1}{2}$ miles northeastward of the entrance to St. Clair River. The entrance is between two piers which jut out at right angles to the shores 1,050 feet. As the shore north of the harbor projects 325 feet farther west than that south of it, the North Pier overlaps the south one by that distance. The piers are 200 feet apart, and in total length are each 1,600 feet, the harbor being all northward of the line of the south one.

Depths.—A depth of not less than 19 feet at standard low water can be carried into Goderich Harbor to the commercial wharf and elevator, and also to the south side of the breakwater separating the river and harbor. Vessels drawing less than 6 feet may get shelter behind the island at the head of the harbor.

There are some conspicuous buildings on the shore, among which in the northeast corner is a steam sawmill and lumber piles. At the bend from the south shore to the southeast shore is a large grain elevator and gristmill. Outside of these and nearly on the beach is the waterworks pump house.

The electric lights of the town are more conspicuous from the lake than is the light shown from the main lighthouse.

Goderich Main Light, fixed and group flashing white, 150 feet above water, visible 18 miles, is shown from a white, square, stone tower with a red octagonal lantern, on the high bank at the southern side of the entrance to the harbor. (See Light List.)

Goderich Breakwater Light, flashing white, 25 feet above water, visible 10 miles, is shown from a white, square, pyramidal, concrete structure on the west end of North Pier.

Fog signal.—The fog signal is made on a diaphone.

Goderich Range Lights—Front Light, fixed red, 41 feet above the water, visible 8 miles, is shown from a square tower, with a red open base, about 40 yards from the western end of North Pier.

Rear Light, fixed red, 65 feet above water, visible 9 miles, is shown from a white, square, skeleton tower located on the beach 475 yards 89° (E. $\frac{3}{4}$ S.) from the front light. These in range lead through the gap between the breakwaters 150 feet south of the Northwest Breakwater Light.

Anchorage.—Good anchorage may be found off the piers in clay bottom, but none in the harbor, which has rock bottom.

Breakwaters.—The northwest breakwater is 500 yards long and 35 feet wide, with concrete superstructure reaching about 8 feet above the water surface, running in a northeast and southwest direction across the prolongation of the channel between the piers; its outer or southwest end is 2,177 feet from the south pierhead.

The southwest breakwater, to the southward of the harbor entrance, is composed of concrete cribs and mass superstructure. The outer end of this structure is 550 feet 146° (SSE. $\frac{1}{2}$ E.) from the outer end of the northwest breakwater, and then extends 467 yards 132° (SE. $\frac{1}{4}$ S.).

Piers—Channel and basin.—Two approximately parallel piers protect the entrance to the inner harbor, which is an artificial channel about 700 feet south of the mouth of the river. The North Pier extends about 400 feet beyond the end of the South Pier, which, starting from the basin, is 1,600 feet long. The width between the piers is 200 feet, except at the outer 100 feet length of the South Pier, where an angle increases the width.

Dredging has provided a depth of 23 feet for a width of 400 feet in the outer entrance, and a depth of 22 feet for a width of 100 feet between the piers. In the inner harbor a channel 1,000 feet long, 300 feet wide, and 20 feet deep has been provided adjacent to the South Pier and the town dock. A passage 400 feet long, 250 feet wide, and 19 feet deep has been dredged across the basin to its north side, where, adjacent to the river breakwater, there was the same depth for a length of 500 feet and width of 150 feet.

Electric lights.—Ten electric lights on poles are located on South Pier. They are conspicuous from the lake and plainly mark the direction of the pier.

Buoys.—The dredged channel is marked by four black spar buoys on the northern side and three red spar buoys on the southern side.

Directions.—To enter the harbor the occulting white light on the north breakwater should be given a berth of 250 feet to southward and the range lights brought on bearing 89° (E. $\frac{1}{2}$ S.) until 200 yards from the front light, when alter course to pass midway between the piers.

Goderich.—From the harbor and lake very little of the town can be seen, but the elevator, waterworks, chimneys, lighthouse, courthouse, and church spires render the place unmistakable. It is the terminus of the Buffalo and Lake Huron Division of the Grand Trunk Railroad and also of a branch of the Canadian Pacific Railroad. It has a population of about 5,000, also waterworks, electric light, telephone, telegraph, and express offices. All the usual supplies can be obtained here and quite extensive repairs made to machinery.

Lifeboat.—A lifeboat, manned by a volunteer crew, is kept in a boathouse on the south entrance pier.

Storm signals.—The usual Canadian storm signals are displayed from a mast standing near the main lighthouse.

Maitland River can not be navigated by anything but the smallest craft, the sandy bar across the mouth not having more than a couple of feet on it. The river formerly emptied itself into the lake through the harbor, but this has been changed, a breakwater having been built and a new mouth made north of the harbor.

Wright Point.—From Goderich the shore, surmounted by a high claybank, trends north nearly 4 miles to an insignificant projection called Wright Point, forming a slight bay fringed by shoal water with a width of 1,175 yards. The point is well marked by a conspicuous summer hotel near the edge of the high bank.

Coast.—From Wright Point the coast, backed at a distance of 100 to 200 feet by a claybank 50 to 60 feet high, trends 11 miles northward from Goderich with a slight inward curve 5 miles to Nine Mile Creek. The edge of the claybank is generally lined with trees, but inside the land is nearly all cleared. From the longer and southern portion of this shore a shallow bank extends 440 yards only, but from a point 2 miles southward of the creek the shore bank makes off twice that distance.

Port Albert, a small settlement around the mouth of the creek, has been abandoned as a harbor. A couple of small piers which have been built are disintegrating. A gravel bar at the entrance shows above water at times. From the offing the place can be picked up by

the half dozen farmhouses and barns with a small church spire 880 yards back.

Point Clark (Pine Point).—From Port Albert the shore trends, with a slight double curve, $13\frac{1}{2}$ miles northward to Point Clark. Until $2\frac{1}{2}$ miles from the latter, the claybank, 100 feet high, skirts the shore closely, leaving no boat landing. The land above the bank is well cultivated, houses and barns being conspicuous among the few trees that have been left. From Port Albert the shallow shore bank is only 440 yards wide, but from a point abreast the small village of Kintail, $5\frac{1}{2}$ miles southward from Point Clark, the bank reaches off $1\frac{1}{4}$ miles and continues with slightly diminishing breadth to Point Clark, whence it extends off 1 mile, and is covered with treacherous bowlders.

Point Clark is an important turning point on the east shore of Lake Huron. It is a low sandy point with a few bowlders strewn along and thickly wooded with pines, birch, etc.

Point Clark Light, flashing white, 93 feet above water, visible 15 miles, is shown from a white, circular structure on the end of the low point.

Clark Reef is a pile of bowlders with 4 feet of water over them situated 1 mile westward of Point Clark Light. The pile is just upon the outer edge of the bank and has been the cause of several wrecks.

The shore.—Point Clark trends very nearly straight northeast a little over 9 miles to the mouth of the Penetangore River and is nearly all a shallow sandy beach lined with bowlders. While the shore itself is low, a claybank 50 to 75 feet high skirts the shore from 100 to 440 yards, except at Point Clark, where the low flat is much wider. The high land has all been cleared for farming, and the farm buildings make conspicuous marks along the shore.

Pine Brook is a small unimportant stream emptying into the lake 1.3 miles northeastward of Point Clark.

Tolmie Reef.—The shore bank continues to Kincardine with gradually decreasing width, excepting at nearly mid-distance between the two places, where Tolmie Reef, with only 12 feet over it, lies at its outer edge. It is $1\frac{1}{2}$ miles from the shore and 4 miles northeastward of Point Clark Light. Only slightly deeper water will be found between this reef and the shore.

Kincardine Harbor, situated at the mouth of the Penetangore River, is the terminus of a branch of the Wellington, Grey, and Bruce division of the Grand Trunk Railroad. A church situated on the rising ground at the northeast part of the town and waterworks standpipe situated close to this church and salt works on the shores of the harbor are conspicuous objects. The small artificial harbor is formed by dredging a small basin at the mouth of the river

and building two piers in a northwesterly direction, at right angles to the beach, 125 feet apart. The north pier is 650 feet in length and the south pier somewhat shorter. The outer 50 feet of the latter turns southward in a west by south direction, making the entrance between the outer ends of the two piers 185 feet wide. The entrance to the harbor is 1 mile south southwest of Horton Point. The major portion of the harbor has a depth of 14 feet below the datum 579 feet above mean tide New York. The channel between the piers is 50 feet wide from deep water to the inside end of the entrance piers, where the deepened area turns southward for a distance of 250 feet. The southern end of the dredged area is 50 feet wide, gradually widening to 90 feet 108 feet northward. For the next 85 feet the dredged area is 205 feet wide, then narrowing gradually to 50 feet at the inside end of the entrance piers. The depth varies considerably owing to freshets from the river.

Range Lights.—**Kincardine Front Light**, fixed red, 35 feet above water, visible 7 miles, is shown from a brown square skeleton structure with an octagonal lantern 400 yards 285° (WNW. $\frac{1}{2}$ W.) from the rear light.

This light should be left on the port hand when entering the harbor.

Kincardine Rear Light, flashing white, 80 feet above water, visible 14 miles, is shown from a white octagonal wooden structure, with a dwelling attached, on the hillside in the town.

These lights in range lead up to the north pier.

Fog signal.—The fog signal is made on a steam whistle.

Caution.—There is a sunken crib with only 10 feet of water on it lying 100 feet northwest of the northwest corner of the north pier. With any sea running, the harbor can not with safety be entered.

The town, situated on the north bank of the river, has several important industries and is a terminus of the Grand Trunk Railroad. It has telegraph and telephone offices. The population in 1911 was 1956.

Storm signals are displayed from a mast on the west side of Huron Street, east side of the harbor basin, and a little south of the entrance.

Life-saving station.—A lifeboat is maintained on the east shore of the harbor.

Horton Point, off which shallow water extends $\frac{1}{2}$ mile, is a very slight sandy point situated 1 mile north northeastward of Kincardine Harbor, the shore between being fronted by a shallow bank 880 yards wide.

Stony Island, 5 feet high, is a small pile of gravel and boulders lying $2\frac{1}{4}$ miles northeast by north of Horton Point and 200 yards off

shore. The island is not conspicuous even close in. The shore between is nearly straight, forming a sand beach strewn here and there with boulders, with a shallow bank extending about 880 yards from it. A bank 20 to 30 feet high near Horton Point, skirts this part of the shore for over 2 miles.

McRae Point.—From Stony Island the shore trends $3\frac{1}{2}$ miles in a north by east direction to McRae Point. From the southern half the shore bank extends 590 yards, increasing in breadth to double that extent off the northern portion. McRae Point is low and composed of boulders,

Iverhuron Bay, contained between McRae and Gunn Points, is a slight indentation about 880 yards southward of the latter. There is fairly good anchorage close under the south shore of Gunn Point. At one time considerable trade was carried on here, but the wharf and storehouses have all fallen into decay.

Gunn Point is low and lies 2 miles north by east of McRae Point, the shore between including Iverhuron Bay, being fringed with boulders to a width of 440 yards.

Douglas Point is, as usual, very low, but stands out more prominently than the others along the shore. It is situated $1\frac{3}{4}$ miles northward of Gunn Point, just north of which there is a slight bay. The shallow bank from the whole shore between the points is 590 yards wide.

Macpherson Point, situated $1\frac{1}{2}$ miles northeast of Douglas Point, is the south entrance point to Baie du Dore. Between these points the shallow bank extends from 200 yards to 590 yards; from Macpherson Point shoal water extends 590 yards.

Scott Point, situated $1\frac{1}{2}$ miles northeast by east of Macpherson Point, forms the north entrance point to Baie du Dore. It is low, stony and rocky, and has shallow water off it 1,320 yards.

Baie du Dore is the three-cornered bay, a little over 1 mile deep, lying between Macpherson and Scott Points. Its shores are low and stony and the water is shallow and foul.

Loscombe Reef, the most important danger between Point Clark and Chantry Island lies off Baie du Dore. It has a least depth on it of 9 feet situated north-northwest 1.2 miles from Macpherson Point and 270° (W. $\frac{1}{2}$ N.) 1.8 miles from Scott Point. From this spot the shoal extends westward 440 yards and eastward a little over 1,329 yards. It is about 590 yards wide and is separated from the bank off Scott Point by a passage 300 yards wide.

Clearing mark.—To pass 440 yards westward of Loscombe Reef, keep McRae Point in sight westward of Douglas Point, bearing 184° (S. $\frac{1}{2}$ W.).

Welsh Bank is a large flat with 9 to 18 feet water over it lying about $1\frac{1}{2}$ miles northward of Scott Point. The bank is an enlarge-

ment of the usual shallow fringe to the shore and is about 1 mile wide.

MacGregor Point.—From Scott Point the shore trends in a general northeasterly direction with a slight curve $5\frac{1}{2}$ miles to MacGregor Point, off which shoal water extends northwestward 1,320 yards to a depth of 12 feet. From the shore between these points, the shallow water stretches off $\frac{3}{4}$ mile.

Scougall Bank is a dangerous enlargement of this shallow bank nearly midway between Scott and MacGregor Points. It extends 1 mile off shore where a depth of 14 feet will be found.

The shore.—From MacGregor Point trends about $4\frac{1}{2}$ miles in a general east by north direction, to Port Elgin. Parts of this shore are sandy beach, but most of it is fronted by shallow bowlders with reefs extending from $1\frac{1}{4}$ to $2\frac{1}{4}$ miles offshore, the most dangerous of which are described.

Belcher Reef is a long, narrow spit that extends 1.6 miles north-northeast from a small point situated 1 mile eastward of MacGregor Point. It has 12 feet near its northeast extremity and rapidly shoals to 7 feet.

Clearing marks.—To pass westward of it keep Macpherson Point in sight westward of the land (Ninemile Point) 1 mile southwest of MacGregor Point, bearing 221° (SW. $\frac{1}{8}$ W.). To pass 590 yards northward of it, keep on the southern range for entering Port Elgin, 104° (ESE. $\frac{1}{4}$ E.).

Boyer Reef is a very shallow spur extending northward 1,320 yards from a small point that lies $1\frac{1}{4}$ miles eastward of MacGregor Point. Outside this very shallow part the reef extends 700 yards farther north. Being marked by reefs on either side, it is not very dangerous except to boats.

Malcolm Reef is long, narrow, and quite detached from the shore. The southwest and shoalest part has only 10 feet water over it and is 1.7 miles 267° (W. $\frac{1}{4}$ N.) from the light on the Government wharf at Port Elgin. Hence the reef extends northeast 880 yards to a depth of 16 feet, with a width of 150 yards. The reef reaches to within 400 yards of the range into Port Elgin.

Dack Spit extends offshore 880 yards from the southwest end of the long sand beach upon which Port Elgin is built. It has only 10 feet of water near its outer end.

Logie Rock, with 11 feet least water on its northern end, is almost joined to Belcher Reef, there being only a narrow passage between, through which the south range at Port Elgin leads. The shoalest spot is 3 miles 35° (NE. $\frac{3}{4}$ N.) from MacGregor Point and 2.1 miles 239° (SW. by W. $\frac{3}{4}$ W.) from the buoy at the south end of Chantry Island Bank, from which it is separated by a clean, deep passage.

From this shoal spot the shoal extends southwestward over 590 yards, and is 300 yards wide.

Clearing marks.—To pass southeast of it keep Douglas Point just touching Ninemile Point 223° (SW. $\frac{1}{4}$ W.). Another mark to pass northwest of Logie Rock is, bring the rear range light at Saugeen River in range with Chantry Island Bank black spar buoy (if discernible) 53° (NE. by E. $\frac{1}{8}$ E.).

Port Elgin is a very small artificial harbor situated in the bottom of a slight bay 4 miles southward of Chantry Island; it is used purely for the landing of supplies for the village.

Approach.—If from Southampton Harbor, take care to give the shore a berth of 880 yards until the south range comes on. If from the north, give the buoy marking the southern end of Chantry Island Bank a berth of 880 yards and steer 175° (south) until the south range comes on. After passing the buoy the master of a vessel should take care to avoid Logie Rock.

Harbor.—The harbor is protected from westerly winds and seas by a breakwater extending in a southerly direction from the northeast shore of the bay, leaving a space about 400 feet wide for the harbor. As the shore is sandy, bars form across the mouth of the bay and partially fill up the channel to the wharf, which has been dredged to a depth of 14 feet. To protect the dredged channel from this littoral drift, a stone groyne has been built out from the shore south of the landing pier and extended by cribwork. The harbor is not difficult to enter, but in leaving, the space is too limited for any but the smallest craft to turn in, and backing out is difficult.

Port Elgin South Range Lights—Front Light, fixed white, 25 feet above water, visible 4 miles, is shown from a small tower with a white shed at the base on the shore 400 yards 167° (S. $\frac{1}{8}$ E.) from the southern end of the Government wharf.

Rear Light, fixed red, 20 feet above water, visible 4 miles, is shown from a white, square tower 50 yards 104° (ESE. $\frac{1}{4}$ E.) from the front light.

Port Elgin North Range Lights—Front Light, fixed white, 21 feet above water, visible 9 miles, is shown from a lantern on the corner of the shed on the northern end of the Government wharf.

Rear Light, fixed red, 31 feet above water, visible 4 miles, is shown from a mast with a shed at the base on shore 220 yards 38° (NE. $\frac{1}{8}$ N.) from the front light.

Daymark.—Back 800 feet from the water's edge in the line of the south range, stands a pole to which is attached a diamond-shaped daymark with two horizontal slats above it, the color of all being white.

A white daymark consisting of a St. Andrew's cross is erected on top of the freight shed where the front light north range is located.

A white diamond-shaped daymark is attached to the pole from which the rear light north range is shown.

Buoys.—Two black spar buoys mark the northwestern side of the dredged cut in the harbor.

Government landing wharf, 170 yards southeast of the central portion of the breakwater, and parallel thereto, is the landing wharf. It is 130 yards long.

Small vessels and tugs may take up a berth near the northeast end of the landing wharf.

Directions (Port Elgin).—If from the southwest, take care not to hide Douglas Point behind the shore southwest of MacGregor (Ninemile) Point 223° (SW. $\frac{3}{4}$ W.) until the south range at the harbor comes on 105° (ESE. $\frac{1}{4}$ E.). Owing to the short distance between these lights this is not a very sensitive range and care must be taken to avoid Logie Rock. Steer on this range until the breakwater is reached, when keep a sharp lookout for the north range. As soon as it comes on steer on it to the wharf, passing southeastward of the two black spar buoys, through the narrow dredged channel, which, between the depths of 9 feet on each side is only 150 feet wide inside the breakwater.

The town is situated on the line of the Wellington, Grey & Bruce Railroad about 880 yards from the harbor. It has telegraph and express offices. Limited supplies can be had and light repairs to machinery made. It had in 1911 a population of 1,235.

Southampton Harbor.—From the north entrance point of the bay containing Port Elgin, the shore trends north-northeast, 3 miles to Southampton harbor, McNab Point, upon which stands the Southampton rear range light, being about midway. From the shore southwestward of McNab Point, shoal water extends nearly 880 yards. The southern part of the shore between McNab Point and the railroad pier is fringed with large boulders, the remainder of the shore being sandy.

The harbor is the shallow area inclosed between Chantry Island and the main shore, and is protected from north winds by two breakwaters, the western one extending in an easterly direction with a curve 600 yards from the northeast extremity of Chantry Island. The eastern breakwater runs in a northwesterly direction from the main shore a similar distance, leaving a passage 200 yards wide between the two. The harbor is exposed to southwesterly winds, and on account of the shallowness of the water only light draft vessels can use it.

Chantry Island lies 1,180 yards westward of Southampton and the main shore, and forms the west side of the harbor. It is 880 yards long northeast and southwest and 440 yards wide. The

island is low, fringed with bowlders, and covered with a small growth of trees. To prevent the shore washing away, a small pier 160 yards long has been built near the southeast point of the island.

Chantry Island Light, fixed white, 94 feet above water, visible 15 miles, is shown from a white, circular, stone structure on the eastern side of the island.

Chantry Island Bank.—Very shallow water under this name surrounds Chantry Island. From the north end of the island it extends in north and north-northeasterly directions nearly 1 mile with depths of 12 and 13 feet, respectively. Off the west side the bank is 440 yards wide.

From the southwestern side of the island very shallow water extends in the same direction 1 mile. The southern end of Chantry Island Bank is narrow and is quite steep-to, there being 26 feet of water 200 feet south of the buoy marking it. The island is connected to the mainland by a bank over which it is difficult to carry more than 12 feet of water, and there are many bowlders strewn about, having over them less than that depth.

Southampton Light and Bell Buoy, showing an occulting red light, is moored in 22 feet, off the northern end of Chantry Island Bank.

Buoy.—A black spar buoy, moored near the remains of beacon about 1 mile 221° (SW. $\frac{1}{4}$ W.) of the southern tangent of Chantry Island, marks the southern end of the bank.

Lambert Shoal, with a least depth of 8 feet on it, lies 1,180 yards northwestward of the mouth of Saugeen River, and from this shallow spot shoal water extends 590 yards south-southwest, but only 100 yards in a north-northwesterly direction.

Clearing marks.—Saugeen River lights (later described) in range 95° (E. by S.) just clear the south end of Lambert Shoal. To pass west of both Lee Bank and Lambert Shoal, keep the north entrance point of Port Elgin in range with the breakwater lighthouse 193° (S. by W. $\frac{1}{4}$ W.).

Lee Bank, with 5 feet water over it, is a long, narrow bank lying parallel to and 880 yards off the shore a little north of Saugeen River. Its shoalest spot is 1.4 miles 7° (N. by E. $\frac{1}{8}$ E.) from Saugeen River breakwater light. From this spot the bank extends southwestward 880 yards and north-northeast $1\frac{1}{4}$ miles almost continuously to a depth of 18 feet.

Southampton Harbor Range Lights.—**Front Light**, fixed red, 28 feet above the water, visible 7 miles, is shown from a white, square, wooden structure, on the eastern end of the west breakwater.

Rear Light, fixed white, 31 feet above the water, visible 10 miles, is shown from a white, square, wooden structure on McNab Point $1\frac{1}{2}$ miles 178° (S. $\frac{3}{8}$ W.) from the front light.

These lights in range 178° (S. $\frac{3}{4}$ W.) lead eastward of Chantry Island Bank.

Fog signal.—The fog signal is made on a steam whistle 880 yards southwestward of Saugeen River.

Pier.—The Grand Trunk Railroad Pier, situated 200 yards inside the eastern breakwater, extends about that distance from the shore with a depth of 12 feet at its outer end.

Directions.—From the north, 16 feet may be carried in between the breakwaters, before arriving within a mile of which, the Southampton range lights should be brought in range bearing 178° (S. $\frac{3}{4}$ W.) and the harbor entered.

From the southwest, a vessel drawing not over 10 feet may enter by keeping the Saugeen River front light tower in range with the outer end of the Grand Trunk Railroad Pier 42° (NE. $\frac{1}{4}$ E.). Vessels may pass nearer the main shore, but at the risk of striking bowlders.

The town of Southampton (Saugeen) had in 1911 a population of 1,685. It is the terminus of the Wellington, Grey, and Bruce division of the Grand Trunk Railroad and has telegraph and express offices. Limited supplies can be had, but there are no facilities for repairing machinery.

Storm signals.—The usual storm warnings are exhibited from a mast erected near the waterworks 440 yards southwestward of the mouth of Saugeen River.

A lifeboat is stationed at Southampton.

Saugeen River.—From the Grand Trunk Railroad Pier, the sandy shore trends northeast, 1 mile, to the mouth of Saugeen River, and is fronted by a shallow bank 440 yards wide. The mouth of the river is protected by a breakwater 400 feet in length jutting out in a westerly direction in the line of the prolongation of the north bank of the river, which is about 20 feet high. The river can only be navigated for a distance of 300 yards. Through the shallow sand and bowlder bank off the mouth has been dredged a narrow channel with a depth of 8 feet at low stages.

Saugeen Range Lights.—Front Light, fixed red, 36 feet above water, visible 7 miles, is shown from a white, square, wooden structure near the outer end of the breakwater on the north side of the Saugeen River.

Rear Light, fixed red, 61 feet above water, visible 7 miles, is shown from a white, square, wooden structure on a hill 755 yards 95° (E. by S.) from the front light.

Buoys.—The dredged cut in the approaches to Saugeen River is marked by three red and three black spar buoys.

Directions.—If bound to Saugeen River from the north, small tugs and sailing vessels not drawing over 8 feet water should steer

on the Southampton range until the Saugeen River lights are in range 95° (E. by S.). These should be steered for until up to the breakwater, when, passing between the spar buoys marking the dredged cut, the breakwater should be passed close south of, and the fishing wharves steered for.

Caution.—Spring freshets sometimes change the channel.

Frenchman Bay is the slight indentation south of the point of the same name. The shore of the bay is foul for 880 yards, and off the slight south containing point is a spit running out northwestward 1,180 yards to a depth of 9 feet.

Frenchman Point.—From the mouth of Saugeen River the shore runs nearly straight 7.3 miles northeastward to a low boulder projection named Frenchman Point. It is for the most part a low boulder beach with small patches of sand, fronted by a bank 440 yards to 880 yards in breadth. The bank from the point itself is only 440 yards wide.

Sable River.—The 5 miles of shore running northward in a slight curve from Frenchman Point to Sable River is, with the exception of the southern 880 yards, which consists of boulders, a clean sandy beach in marked contrast to the general character of the shore. It is fronted by a sand bank 880 yards wide. The mouth of the river is protected by a large dry reef lying 590 yards west of it, but only 3 feet of water can be carried in. A small quantity of lumber is cut on the bank of the river a short way up, brought down in and loaded from scows to vessels anchored off the mouth.

Chiefs Point.—From Sable River, the shore trends northwest $1\frac{1}{2}$ mile and then north 1 mile to a low shelving point and Indian reserve named Chiefs Point. The southeastern portion of this shore is fronted by a shallow rocky bank $\frac{1}{2}$ mile wide, the middle part by a reef extending 1,180 yards to a depth of 14 feet, and thence to Chiefs Point the bank is 880 yards in breadth.

Fishing Islands (Ghégheto Islands) are a group of small, low, thinly wooded islands extending from Chiefs Point to Pike Bay, 11 miles. The islands are fronted by a continuous shallow bank, extending in some cases $1\frac{1}{2}$ miles offshore, but outside this bank the water is good and soon deepens to 10 fathoms. Among the group are several good anchorages.

Whitefish Island, about 10 feet high and well wooded with small trees, is the most southerly of the group. It is over 440 yards long, north-northwest and south-southeast, and is situated a little more than 1 mile northward of Chiefs Point. Between them 11 feet can be carried and deep water reaches to within 200 yards of the western side.

Cigar Island is a small, round island lying about halfway between Whitefish Island and Lonely Point.

Anchorage.—About $\frac{1}{4}$ mile eastward of Whitefish Island is a small anchorage in 14 to 17 feet over mud. The shelter is very good, but a heavy roll comes in with westerly winds. The entrance to the anchorage, 250 yards south of Whitefish Island, is hard to make and very narrow, with a greatest depth of 11 feet. A stranger is advised to examine the channel from a boat before attempting with a vessel. The survey steamer *Bayfield* entered by keeping a boathouse on the main shore northeast of Lonely Point in range with the north side of Cigar Island 62° (ENE. $\frac{1}{4}$ E.). The worst spots to pass are close southward of this range, with 6 to 8 feet on them.

In thick weather or at night vessels approaching the shore all the way from Cape Hurd to Chiefs Point should not shoal to less than 10 fathoms.

Smokehouse, Cranberry, Indian Jack, and Rownes Islands form a group stretching $1\frac{1}{2}$ miles south of Main Station Island. They are all low, covered with small trees, surrounded by very shoal water, and are separated from the mainland by about 1 foot of water.

The western edge of the bank from the above group with 14 feet water on it is situated 880 yards southwest from Scotch Bonnet Island.

The south end of the same bank, with the same depth on it, lies 1.3 miles southward of the same island and 1,180 yards in a westerly direction from the west end of Cranberry Island, with deep water between.

Scout Reef, about 5 feet high, stands well outside the nearest island. It is small, quite bare, and is situated 1,320 yards northwest of Scotch Bonnet, the nearest island. Shallow water extends $\frac{3}{4}$ mile southwest from Scout Reef to 12 feet, 880 yards westward to 14 feet, and the same distance southward to 11 feet. There is no passage between Scout Reef and Basswood Island.

Clearing marks.—To pass westward of the spur from Scout Reef and all the shallow water off Main Station Island, keep Kolfage Island open west of Ghegheto Island bearing 1° (N. $\frac{1}{4}$ E.). To pass south of it keep the south side of Main Station Island open southward of the trees on Scotch Bonnet, bearing 79° (E. $\frac{3}{4}$ N.).

Scotch Bonnet Island, so called on account of the appearance of its trees a few years ago, although now most of the trees have been cut down, is near the northwest edge of the bank from the Main Station group and lies close to the edge of the deep water.

Anchorage under Burke Island.—Between the shoal water off Scout Reef and Scotch Bonnet is a lane of water about 20 feet deep leading nearly to Basswood Island. To use this lane keep the mill stack at Red Bay in range with the west side of the trees of Basswood Island bearing 25° (NNE. $\frac{1}{4}$ E.), and when the north side of Main Station Island bears 72° (E. by N.) steer to pass 300 yards

northward of it, though as little as 12 feet may be found on this track. When the north point of the latter island comes abreast haul northward for the anchorage 590 yards southeastward of Burke Island. A master of a vessel should proceed slowly and keep the lead going.

Main Station Island was at one time the most important fishing station on the lake and upon it are still the remains of the first stone house of the neighborhood, but none of the Fishing Islands are occupied now. It is about 10 feet high, 880 yards long southwest by west and northeast by east, 590 yards wide, and lies close northward from Indian and Rownes Islands. From its northeastern point, a very shallow reef stretches northeastward, over 880 yards. The water between Main Station on the south and Basswood and Burke Islands on the north has a nearly uniform depth of 12 to 16 feet.

A small spot with 6 feet water over it, lies near the track to the anchorage southeastward of Burke Island. It lies 590 yards westward from the northwest point of Main Station Island.

Basswood Island, surrounded by very shallow water, is a small islet situated nearly 1 mile east-northeastward of Scout Reef.

Burke Island is only important on account of the anchorage southeastward of it. It lies over 1,320 yards north-northeast from the north point of Main Station Island. It is about 10 feet high, over 590 yards long north-northeast and south-southwest, and 440 yards wide. Between Burke and Beament Islands there are many islets and rocks but no passage for the smallest craft, small rowboats excepted.

McCallum (Snake) Island, 10 feet high, covered with small trees and with a couple of small huts on it, is situated $1\frac{1}{4}$ miles north-northwest from Burke Island and is the northern of a group of islands and reefs 880 yards wide, stretching $1\frac{1}{4}$ miles in a southerly direction from it, and through which there is barely passage for a boat.

From McCallum Island a very shallow reef extends northeastward, $1\frac{1}{4}$ miles and between this reef and Tyson Island, not more than 9 feet water can be carried to Red Bay.

Beament Island, about 10 feet high and well wooded, lies with its northern end 1,180 yards west-northwestward of McCallum Island. It is 590 yards long south-southeast and north-northwest, by 150 yards wide. There are a few old fishermen's huts on the east side of the island. Shoal water extends west from the island 880 yards, to pass west of which keep Kolfage Island open westward of Cavalier Island 6° (N. by E. $\frac{1}{4}$ E.), or keep the gap between Ghegheto and Cavalier Islands closed 20° (NNE. $\frac{3}{4}$ E.)

Anchorage.—There is a small but limited anchorage 440 yards northward of the island, in 21 to 24 feet water, to which 4 fathoms may be carried from outside through a very narrow channel.

Cavalier Island is upon the same very shallow bank as Ghegheto Island from which it lies 880 yards in a southwesterly direction. It is about 10 feet high, nearly square in shape, and 100 yards long. The deep water reaches to within 300 yards of its west point, but the reef extends southward 590 yards, dropping suddenly to 4 fathoms in a channel 100 yards wide, through which with care a vessel can enter the small but excellent anchorage northward of Beament Island just alluded to.

Between the reefs from Cavalier Island and St. Jean Point it is not advisable for a stranger to attempt to pass. The survey could not discover any safe track. About 11 feet may be carried from the above anchorage to Golden Valley and Red Bay but the track must be used with great caution. Steer straight for the south end of the wharf at Golden Valley from the anchorage north of Beament Island, as no intelligible clearing mark can be given.

Ghegheto (Round) Island, lying 880 yards northeast of Cavalier Island, is 590 yards long south-southwest and north-northeast and 200 yards wide. Shoal water extends only 100 yards off its northern end, but the northern edge of the bank trends westward 1,320 yards from this.

Drake Shoal, with 9 feet least water on it, almost blocks the outer west entrance to the channel, separating the shallow banks from Ghegheto Island and Chimney Reefs. Its north and shoalest part lies nearly 1,320 yards northwest from the northern end of Ghegheto Island, and it trends in a southwesterly direction 300 yards to a depth of 10 feet. The passage is preferably south of Drake Shoal and is only 150 yards wide, but for use it should be buoyed. Those locally acquainted, trading in small schooners to Golden Valley and Red Bay, enter by this channel and head 86° (E. $\frac{1}{4}$ S.) nearly straight for Golden Valley, carrying not more than 8 or 9 feet water through very narrow gaps.

Chimney Reefs are a collection of low, dry rocks extending from the southern end of Kolfage Island, $1\frac{1}{2}$ miles southward affording good protection to an anchorage behind them. The reefs are fronted westward by shallow water for $1\frac{1}{2}$ miles.

Hattie Rock has less than 6 feet over it and is on the outer edge of the Chimney Bank. It lies in a westerly direction over 1,320 yards from the most westerly Chimney Reef.

Harrison Shoal, 440 yards outside and westward of the rest of the bank, has a least depth of 7 feet over its middle, nearly $1\frac{1}{2}$ miles west-northwest from the nearest Chimney Reef. The shoal is 590

yards long, northeast and southwest, and between it and Barrett Reef is a lane of deep water whose sides converge and meet just outside Pike Point.

Clearing mark.—To pass west of all these shoals keep Beament Island westward of Cavalier Island 135° (SE. $\frac{1}{2}$ S.).

Kolfage (Green) Island, 6 feet high, is the northernmost of the Fishing Islands. It is nearly round, about 225 yards in diameter, and its most northerly point is situated 880 yards south-southwest of Pike Point, to which it is connected by very shallow water.

Anchorage.—The anchorage space inside and eastward of Ghegheto Island and Chimney Reefs is quite large but has to be carefully used, as there are many rocky spots with 11 to 16 feet over them scattered about. Buoys should be placed both for entering and marking dangers near the northern end of Chimney Reefs.

Lonely Point is situated $1\frac{1}{2}$ miles northeast from Chiefs Point and the bay between them is all very shallow and foul.

Reid Point is a low, foul point, 4.6 miles northward of Lonely Point, the gently sweeping shore between them being all low and very shallow, and composed mostly of sand and rushes protected by boulders. Only 6 feet can safely be carried between the point and Corsair Reef lying 880 yards west.

Red Bay, on the south entrance point of which is erected a small steam sawmill, situated 1 mile north of Reid Point, is $1\frac{1}{2}$ miles wide at its mouth and about $\frac{1}{2}$ mile deep. As stated, only 9 feet can be carried southwest of Tyson Island, and barely 6 feet can be brought up from the south.

Tyson Island shelters Golden Valley from the southwest, and, like all the other islands, is low and covered with small trees.

Golden Valley is a small bay whose narrow entrance is situated 1,180 yards east-southeast from St. Jean Point. It was formerly the site of a small sawmill, but very little of it remained in 1900. As before stated, 11 feet may be carried to the old wharves at the mouth of Golden Valley, but the channel requires very careful navigation. It is straight from the anchorage north of Beament Island, but shallow rocks are dangerously near the track on both sides.

St. Jean Point, with a very foul bank extending from it, is situated $1\frac{1}{2}$ miles eastward of Ghegheto Island.

Anchorage.—Between St. Jean Point and Chimney Reefs is an anchorage space 1 mile long north and south, by 880 yards wide, but the master of a vessel must pick his ground to avoid the rocky spots strewn about.

Pike Bay.—From St. Jean Point the shore forms a slight bow to the entrance to Pike Bay, nearly 3 miles north. The bay may be recognized by a small steam sawmill erected upon the east shore near the entrance. The bay is 440 yards wide at the mouth and runs in

a north-northeast direction 1 mile, but is too shallow for anything but light-draft craft.

Pike Point, as previously stated, lies 880 yards north-northeastward of Kolfage Island, being connected therewith by very shallow water.

Purgatory Cove.—From Pike Point the shore line trends in a north-northwesterly direction $2\frac{1}{4}$ miles to the southern entrance point of Little Pike Bay, and 880 yards nearer to Pike Point is Purgatory Cove, which has shelter for small boats only. This stretch of shore is indented by slight points and bays, but Purgatory Cove is the only one in which even a boat can get shelter. The bank off this locality is particularly foul even for this coast, and masters of vessels are advised to give it a berth of at least 2 miles, or not to proceed inside the 10-fathom curve which is only 880 yards westward of Lincoln Shoal and Milton Bank.

Barrett Reef, awash, lies 1.3 miles westward of Pike Point. From this spot the reef runs to the north 590 yards, and to the south 200 yards, being 440 yards wide. No vessel should attempt to pass between Barrett Reef and Pike Point or inside the line of the three shoals next mentioned.

Milton Bank is another outlying danger having upon it only 3 feet water, and the shoalest part bears west-northwest, and is $2\frac{1}{4}$ miles from Pike Point. The shoal is over 590 yards long in a north and south direction, and 440 yards wide.

Wells Shoal is small and lies 880 yards outside the next mentioned. It has upon it a depth of 14 feet and bears 227° (SW. $\frac{1}{4}$ W.) 2 miles from Little Pike Point.

Lincoln Shoal is a large bank with depths on it varying from a couple of feet to 3 fathoms. The shoalest spot is on the east edge near the south end, and bears 207° (SW. by S.) 1.6 miles from Little Pike Point. From it the shoal extends southwest 880 yards, west-northwestward the same distance, and north 1 mile, the last with 13 feet at its northern extremity bearing 243° (WSW. $\frac{1}{8}$ W.) from Little Pike Point.

Little Pike Bay.—The narrow entrance to this small anchorage is 880 yards southward from Little Pike Point. Good but limited anchorage for small craft can be had off the sawdust point on the south shore in 3 fathoms, but not more than 11 feet can be carried in through a narrow, crooked channel with a very sharp turn in it. Inside the sawdust point the bay rapidly shoals and is very foul. Off the south entrance point the northern edge of a very foul bank makes off west-southwest nearly 1 mile, thence turning and running south the same distance. The deep water of the lake, in a narrow lane, reaches close to the entrance to Little Pike Bay.

Little Pike Point, 880 yards north of the bay of that name, forms the southeast entrance point to the shallow and foul bay southeastward of Lyal Island. It is situated 2.6 miles southeastward of the south point of Lyal Island, and except for the lane of deep water between Murton and Lyal Reefs, a vessel can not pass northward of Little Pike Point.

Murton Reef, with 7 feet of water on it, is situated on the southwestern extremity of a large bank fronting the main shore southeast of Lyal Island. It lies 1.5 miles west-northwest of Little Pike Point and 1.6 miles south by east from the south point of Lyal Island. The master of a vessel desiring to proceed further north may do so by keeping the rear lighthouse tower in Stokes Bay in range with the east side of Dane Island bearing 20° (NNE. $\frac{3}{4}$ E.).

The channel between Murton and Lyal Reefs is almost filled up by a couple of reefs, on each of which is a depth of 13 feet. Narrow lanes of deeper water separate them from each other and the two main reefs. From Murton Reef the southern edge of the bank trends in a south by east direction 1.6 miles to the entrance of Little Pike Bay.

Lyal Reef is the long spit extending southwest by south 2 miles from the southern extremity of Lyal Island. At about mid-distance out the reef is $1\frac{1}{4}$ miles wide and is mostly very shallow, there being only 6 feet at 880 yards from and 12 feet close to the end.

Wanderer Shoal, with 11 feet least water on its northern end, lies a little under 1 mile southwestward of Lyal Island Lighthouse. It extends south by east 590 yards and the same distance south-southwest. A spot with 15 feet water over it lies nearly 440 yards westward of Wanderer Shoal.

Channel east of Lyal Island.—About 440 yards southeastward of the south point of Lyal Island is the northwestern edge of a lane of deep water. At this position this lane is 1,180 yards wide and 5 to 7 fathoms deep, and extends in a northeasterly direction (gradually narrowing) to within 1,320 yards from Shute Point of Stokes Bay, but there is no passage between the latter and Lyal Island for any craft drawing more than 6 feet.

Directions.—If for any reason the master of a vessel wishes to proceed eastward of Lyal Island, he can do so by bringing the back range lighthouse tower on Shute Point in range with the southeast side of Dane Island, 20° (NNE. $\frac{3}{4}$ E.). This will take him to within $\frac{1}{4}$ mile of Dane Island, when he should feel his way 1 mile farther northeast by the chart, as no directions can be given.

Shute (Black) Point is situated $4\frac{1}{4}$ miles northward of Little Pike Point, and 1,320 yards northeastward of McMaster Point of Lyal Island. It marks a sharp turn in the southeast shore of Stokes Bay and its very dark shade renders it conspicuous.

Stokes Bay.—The entrance to this excellent harbor lies between Greenough Point and Lyal Island. There are two navigable channels into the bay, one on either side of Mad Reef, but the southern is the only one used. When once entered, the anchorage space is over a square mile in area and any depth from 2 to 6 fathoms can be had. Although the entrance is wide, no sea enters, being broken up by the many reefs outside. Shelter from any particular wind can be had by selecting one's berth.

Lyal Island is about 25 feet high, covered with small trees, and shelters Stokes Bay from south winds. It has the shape of an irregular triangle, the north side trending westward $1\frac{1}{2}$ miles to the north-west point of the island. For the western 1,320 yards of this north coast the deep water approaches to within 200 yards, but 880 yards westward of McMaster Point the edge of the shoal water turns suddenly north, blocking any passage farther east. The southeast side trends southwestward 2 miles from McMaster Point to the sharp south point of the island. From the latter the west coast trends northwestward 1.3 miles to the northwest point, and is fronted by shallow water extending westward 1 mile.

Lyal Island Light, fixed and group flashing white, 51 feet above water, visible 15 miles, is shown from a white, square tower, with a dwelling attached, on the western side of the island. (See Light List.)

Caution.—In thick weather or at night do not shoal to less than 10 fathoms when off Lyal Island or any of the shore between it and Cape Hurd.

Knife Islands are a small group 590 yards long east and west by 250 yards wide, lying 880 yards northward of McMaster Point. The anchorage space of the bay approaches to within 440 yards of the islands, but shoal water connects the group with Lyal Island and Shute Point.

Clearing mark.—To pass westward of all the shoal water off Knife Islands, keep the westernmost hut at Stokes Bay Village in range with the wet side of Garden Island 27° (NE. by N.). This mark will lead from the main lighthouse range to near Garden Island, when a vessel should haul more northward to pass midway between Garden and Tamarac Islands, and anchor when a convenient depth is reached.

Saturn Rock, with 14 feet least water over it, may be said to be the outer rock off Lyal Island. It is small and lies about $1\frac{1}{2}$ miles 261° (W. $\frac{1}{4}$ S.) from Lyal Island Light. The range leads 440 yards north of it.

Buoy.—A red spar buoy usually marks this danger.

Seashell Rock, with only 9 feet water over it, lies 880 yards westward of Ripple Bank, and 300 yards south of the range.

Buoy.—A red spar buoy usually marks this danger.

Ripple Bank is a large shallow bank extending from the western side of Lyal Island. The outer end with 11 feet on it is 1,320 yards westward of Lyal Island Light, but the more dangerous spot for vessels entering the bay has 9 feet over it and lies west-northwestward the same distance from the light.

Buoys.—A red spar buoy moored 200 yards south of the range marks the northwest spur of Ripple Bank. A similar buoy is placed 1,320 yards northeastward of the above, and marks the bank, which, here, extends only 250 yards from Lyal Island. The range passes only 50 yards north of the bank at this buoy.

Cornet Ground is the most outlying danger in the approach to Stokes Bay. It is a large bank 1,180 yards long northeast and southwest, by over 440 yards in width. The least water on the ground is 10 feet a little northeast of the middle, and is about $2\frac{1}{4}$ miles 289° (NW. by W. $\frac{1}{4}$ W.) from Lyal Island Light. There is only a depth of 11 feet at the southwest end. A shallow bank almost connects Cornet Ground and Greenough Bank. A rock with 11 feet on it lies about 880 yards southeastward and a shoal with 17 feet on it lies a little to southward, respectively, of Cornet Ground.

Buoy.—A black spar buoy usually marks this danger.

Mad Reef is $2\frac{1}{2}$ feet above the water, without trees, about 440 yards long northeast and southwest by 200 yards wide, and lies with its southwest point about 1 mile 334° (N. by W. $\frac{1}{4}$ W.) from Lyal Island Light. Shoal water extends southwest 880 yards, east 440 yards, and northward 200 yards from it; while on the northwest side of the reef the deep water reaches to within 100 yards, and on the southeast side to within 200 yards. The channel between this reef and that from Greenough Point is only 100 yards wide and is not used. That on the south side is 300 yards wide and is the one used and buoyed.

Buoy.—A black spar buoy usually marks the southwest end of the shallow water from Mad Reef.

A rock with 17 feet least water over it, lies nearly 590 yards east-southeastward of the northeast end of Mad Reef.

Stokes Bay Range Lights.—**Front Light**, fixed white, 30 feet above water, visible 10 miles, is shown from a white, square, wooden structure on the northwestern end of the westernmost of the Knife Islands.

Rear Light, fixed white, 61 feet above water, visible 13 miles, is shown from a brown, square, skeleton structure with white inclosed upper part 1,417 yards 69° (ENE. $\frac{1}{2}$ E.) from the front light.

These in range lead within 590 yards of the front light, or 1.3 miles northeast of Lyal Island Light, with a least depth of 22 feet, to

be found when passing the inner black, and again at the inner red buoy.

Irish Harbor.—The entrance to this useless boat cove is situated on the eastern shore of the bay, 880 yards northward of Shute Point.

Garden Island, 590 yards long northeast and southwest and 300 yards wide, is about 10 feet high and covered with small trees. It lies $1\frac{1}{4}$ miles northward from Shute Point and 1,180 yards southwestward of Stokes Bay Village. Very shoal water connects it with the eastern shore of the bay, but vessels drawing 10 feet may anchor between the middle of the island and Tamarac Island wharf.

A shallow spit extends from the southwest end of Garden Island in a southwesterly direction, 1,320 yards, leaving a narrow lane 300 yards wide of deep water between it and the bank from Knife Islands, through which a vessel may pass close over to the east shore for a short distance.

Tamarac Island is small, 880 yards long, very narrow, and just separated from the southeastern shore of Ferguson Point. Its north end is well marked by a small steam sawmill and lumber piles. At the wharf only about 6 feet of water will be found.

Stokes (Big) River is a very small stream emptying into the northeastern corner of Stokes Bay; boats can carry 3 feet to about 100 yards above the mouth.

Stokes Bay Village.—On the west bank of the above-mentioned river, near its mouth, is situated the small village, post office, and telegraph station of Stokes Bay. It has a population of about 100, and is connected by stage with Lions Head in Georgian Bay and Tobermory.

Ferguson Point, separating Stokes and Gauley Bays, is distant in a west-southwest direction nearly $1\frac{1}{4}$ miles from Garden Island. A spit extends 1 mile southwesterly from this point to the depth of 13 feet, and south-southeastward 880 yards to the depth of 14 feet, with only 11 feet at 590 yards. The southeastern part of the point may be approached to 300 yards.

A detached rock with 15 feet on it, lies south-southeast nearly 1,180 yards from the same point, thus almost connecting the spur from Ferguson Point to the bank from Knife Islands. To pass between, however, keep the lone hut at the west end of the village of Stokes Bay in range with the west side of Garden Island, bearing 27° (NE. by N.).

Gauley Bay is the long foul bay northwest of Ferguson Point, and no vessel should pass north of a line running east through the south end of Ferguson Point.

Greenough Point, the northwest entrance point of Stokes Bay, is situated $1\frac{1}{4}$ miles westward of Ferguson Point, or $1\frac{1}{4}$ miles from

Lyal Island Lighthouse. The point, sharp at the end, is about 1,180 yards wide 1 mile back, between the head of Gauley Bay and Greenough Harbor. Off the extreme point shallow water runs southward 880 yards, while from its southeast side the bank extends over 590 yards. On the western side the bank is only 200 yards wide, but the southeast side should receive a berth of at least 590 yards.

There are several shoal spots between the point and the south end of Greenough Bank, but no one unacquainted should venture inside the outer reefs.

Directions.—A vessel should not shoal to less than 10 fathoms until the Stokes Bay range lights are in range, bearing 70° (ENE. $\frac{1}{2}$ E.). These should now be steered for, passing southeast of the black and northwest of the red spar buoys, with depth of 22 feet. When Mad Reef is abaft the port beam, a vessel may haul northward of the range, and anchor in 5 to 6 fathoms 880 to 1,320 yards northeast of Mad Reef. If proceeding to Garden Island, which should not be attempted by a stranger at night, continue on the range of lights until the western hut (1905) is in range with the western side of Garden Island, bearing 27° (NE. by N.). This mark leads to anchorage between Garden and Tamarac Islands.

Simon Point, long and narrow, is situated nearly 1 mile northward from Greenough Point, the bight between them being open and shallow. Simon Point, from which shoal water extends 200 yards, forms the southern entrance point of Greenough Harbor. It is behind Greenough Bank, from which it is separated by a lane of deep water 880 yards wide.

Greenough Harbor.—The entrance to this excellent little boat harbor is northward of and along the northwestern side of Simon Point. A depth of 6 feet may be carried in, and perfect shelter had behind the north coast of Simon Point marked by fishermen's huts.

Greenough Bank is the northern bank of the string of shoals already described, extending $23\frac{1}{2}$ miles from Chiefs Point to Bradley Harbor. The north end of the bank is 880 yards northwestward from Scotch Thistle Point, but the southwestern extremity lies $1\frac{1}{2}$ miles westward from Greenough Point, the nearest land. The western edge of the bank with 13 feet on it, lies a little over 1.3 miles southwest from Scotch Thistle Point. On the bank itself (over 1 mile wide) are many spots barely covered. A narrow lane through which 20 feet can be carried, exists between Greenough Bank and the shore, but should not be attempted by strangers.

Scotch Thistle Point is not very prominent, but marks the beginning of the very large Greenough Bank just described. It is situated $1\frac{1}{2}$ miles north-northwest from Greenough Harbor. A rock with less than 6 feet water over it lies over 880 yards northward, and another 250 yards southwestward of Scotch Thistle Point.

Bradley Harbor is another foul bay fit only for small tugs and boats. Its entrance is 1.3 miles northward of Scotch Thistle Point, the shore between taking the form of a slight bay from which a bank extends nearly 440 yards. The bay is very irregular in shape, about 440 yards wide at the mouth and 880 yards deep. There are several rocks and islands in the bay. The shallow shore bank in the vicinity of Bradley Harbor is 440 yards wide. A rock, with 16 feet over it, is situated 440 yards southwestward of the entrance to Bradley Harbor. Another rock with 18 feet over it, lies in the same direction nearly 1 mile from the same.

French Harbor is a small boat cove in the south side of Pleasant Point 590 yards east of the end.

Pleasant Bay is a shallow foul bay nearly 1 mile wide across its mouth and 880 yards deep, situated with its south entrance point nearly 1 mile north-northwest from Bradley Harbor. At the bottom of the bay, the shore is broken and an inner cove formed, but the entrance is very shallow. The bank from the south entrance point is over 880 yards wide.

Pleasant Point, separating French and Little Pine Tree Harbors, forms also the northwest entrance point of Pleasant Bay. The shoal bank extends 880 yards westward from the end of the point, but on the south side is not so wide. A rock with 17 feet water over it, is situated nearly 1 mile southwestward from Pleasant Point.

Little Pine Tree Harbor.—Juno Point, nearly 1 mile northwest of Pleasant Point, is the projecting north entrance point of Pine Tree Harbor, which runs in nearly 1 mile eastward of it and affords limited but good shelter for boats and small tugs not drawing more than 5 feet. From Juno Point, shoal water extends in all directions 590 yards. The entrance is 200 feet wide with a depth of 6 feet, and to the entrance 11 feet may be carried by bringing it to bear 44° (NE. $\frac{1}{2}$ E.) to lead between two very shallow banks. A very shallow rock is situated exactly in the middle of the harbor.

Pine Tree Point is situated nearly 1 mile north-northwest from Juno Point, and from the southern extremity of the former, shoal water extends in a west-southwesterly direction 590 yards. Shallow water extends also southward 440 yards from Pine Tree Point.

A rock with 16 feet on it is situated 880 yards southwestward from Juno Point.

Sibert Point, 590 yards northward of Juno Point, is insignificant and forms the southeast entrance point of Pine Tree Harbor. Shoal water extends 880 yards from it in a southwesterly, and over 440 yards in a westerly direction, or almost to the range into the harbor.

Pine Tree Harbor, so called on account of two conspicuous pine trees that grew on the ridge at the back of the harbor, is 200 yards wide, and extends nearly 1 mile in a northeasterly direction from

Pine Tree Point. A depth of 10 feet may be carried to the wharf on the western shore just inside the point through a narrow channel between very shallow rocks, by keeping the old lighthouse towers in range bearing about 33° (NE. $\frac{1}{2}$ N.) until nearly up to the wharf. The water rapidly shoals inside the southern side of the wharf. Approaching the harbor from the south it is easily recognized by its lumber piles and steam sawmill on the western shore. There is a post office with biweekly mail. The population is about 100 (1900), chiefly employees of the mill with their families.

It is not a harbor for a stranger to make in heavy weather, as Gilphie Reef will probably break, and the line of the towers leads over the worst part. Those better acquainted can pass around the reef and bring the range on to pass through the narrow channel. Zinkan Island, lying on the east side of the channel into Pine Tree Harbor, is small and 5 feet high.

Day beacons.—The old lighthouse towers, alluded to above, were in good shape as day beacons in 1914. They are not lighted, but arrangements can be made with the local authorities to hang lanterns on them.

Gilphie Reef, with 13 feet least water over it, is a large bank lying directly in front of the entrance to Pine Tree Harbor. It is 590 yards in diameter, and its middle and shoalest part lies 880 yards south-southwestward from the southern end of Pine Tree Point. The two day beacons in one, bearing about 33° (NE. $\frac{1}{2}$ N.), lead over the middle of it. The front tower just touching the trees on the east side of Pine Tree Point bearing about 47° (NE. $\frac{3}{4}$ E.) leads west of the reef. There is a narrow lane of good water between Gilphie Reef and the shoal bank from Sibert Point.

Deadman Point is situated 1,320 yards northwestward of Pine Tree Point, the bay between them being foul and useless. Deadman Point, gradually rounding, is beset with shoal water to over 440 yards.

Terry Point, the southeast entrance point of the bay containing Johnson Harbor, is situated $2\frac{1}{4}$ miles north-northwest of Deadman Point, the slightly concave shore between them being broken up into several unimportant coves, bays, and points, lined with shallow water with a width of 590 yards. It is steep to on the harbor side, but a spit makes out 440 yards in a southwesterly direction from its most southerly part.

Johnson Harbor is a small, well-sheltered cove at the head of a bay running in northeastward 1,320 yards from Terry and Johnson Points. There is a large steam sawmill on the north shore of the harbor, to the wharf belonging to which a narrow channel with depth of 11 feet has been dredged. The entrance to the harbor is

northeastward of the inner narrow northeastern extremity of Johnson Point. For the first 440 yards from the outer white wooden beacon, the southeastern side of Johnson Point should receive a berth of 200 yards. After passing the stone beacon the beach may be kept closer aboard until near the turn in to the wharf.

Beacons.—The outer beacon, white wooden, is near the southern extremity of Johnson Point.

The inner beacon, stone, is about 440 yards 64° (ENE. $\frac{1}{4}$ E.) from the outer beacon.

Anchorage.—Limited anchorage can be had in the bay of approach to Johnson Harbor, but of course is exposed to southerly and southwesterly winds.

Johnson Point, low and marked by a white wooden beacon, is situated 590 yards northwest of Terry Point and forms the northwest entrance point, and gives shelter to the bay containing Johnson Harbor.

Huntress Reef is the spit extending west-southwest 880 yards from Johnson Point.

Porcupine Point, bare and low, is situated a little more than $1\frac{1}{4}$ miles northwestward from Johnson Point. Deep water approaches close to the point on the west side.

Corisande Bay is an unimportant bay with its north shore running in nearly 1 mile eastward from Porcupine Point, which bears from the southeastern entrance point of the bay northwestward and is distant nearly 1 mile, and no vessel should pass inside the line of these points.

A shallow spit extends from this southeast entrance point westward a little over 880 yards, leaving a lane of deeper water penetrating a little farther into the bay.

Porcupine Reef is a long narrow spit extending 1,180 yards in a west-southwest direction from the point of the same name, and having a depth of 11 feet over it.

Cataract Rock is a small spot with 17 feet water on it lying 440 yards farther from Porcupine Point in the same direction.

Another reef with 15 feet least water on it, is situated 1,180 yards in a westerly direction from the same point, and one with 17 feet over it, southwestward the same distance from this point.

Coal Oil Point, small and narrow, lies 1,180 yards northward from Porcupine Point, the bay between being open and very foul, the flat extending nearly 590 yards outside the line of the points. It is chiefly important as forming the south entrance point of Little Eagle Harbor.

A rock with less than 6 feet water on it is situated southwest, over 590 yards from Coal Oil Point.

Little Eagle Harbor is a small but good boat harbor into which 18 feet may be carried through a narrow channel by steering 73° (E. by N.) for Coal Oil Point and passing close northwest of it.

Little Eagle Point is situated 1,180 yards about 281° (WNW. $\frac{1}{2}$ W.), from Coal Oil Point, and is surrounded by shoal water for a distance of 440 yards.

Campbell Reef is a very dangerous narrow obstruction with 11 feet least water on it, lying 1.3 miles 248° (WSW. $\frac{3}{4}$ W.) from Little Eagle Point, and from it the shoal extends 440 yards west, and over 590 yards east by north. A vessel will pass 880 yards south of Campbell Reef by keeping the trees on Cape Hurd just in sight southwest of Baptist Island, 318° (NW. $\frac{1}{4}$ N.).

Dorcas Bay.—From Little Eagle Point the shore trends over 1 mile in a northerly direction, and thence north-northeast a little less than 2 miles, forming the southeast shore of Dorcas Bay. The first stretch has shoal water extending 440 yards from it. This bay is a little over 1 mile across its mouth in a southeast direction from Pendall Point, then it trends northeast nearly $1\frac{1}{2}$ miles. The whole bay is foul and useless.

Pendall Point lies 2 miles north by west of Little Eagle Point and has shoal water extending 440 yards from it.

Warner Point, $1\frac{1}{2}$ miles westward of Pendall Point, is a long, crooked point shaped like a boot, the toe pointing westward. It may be recognized by being composed of large limestone gravel, and stones, piled nearly 10 feet high. Shoal water, extends westward from it 440 yards and southward 590 yards, when it runs eastward straight to the southern edge of the bank from Pendall Point, already mentioned. On the northwestern side the deep water comes close in.

Eagle Harbor is the large bay between the two points last mentioned. It is very shallow and foul, and fit only for boats and small tugs.

Warner Bay forms one of the anchorages on this shore, the best place for shelter being about 300 yards northward of the western extremity of Warner Point or the toe of the boot, in 3 or 4 fathoms over sand and mud.

Youell Island, small and 5 feet high, lies close to the shore and 1,180 yards westward of Warner Point, from which line Warner Bay runs in 1,320 yards in a northeast direction with a width of 590 yards. Shoal water extends 300 yards south from the island.

Hopkins Point, the south entrance point of the bay of the same name, is situated 1.3 miles westward of Warner Point. It is rather sharp and low, with shoal water extending 1,320 yards from its southern side, and westward 300 yards.

A rock with 6 feet water on it lies 590 yards 326° (NNW. $\frac{3}{4}$ W.) from the southwestern extremity of Hopkins Point. It is on the very edge of the bank from the east shore of the bay.

Hopkins Bay, the bottom of which is nearly $1\frac{1}{4}$ miles northward of Hopkins Point, is about the same distance wide in a northwesterly direction from the same point and is open to southwesterly winds. There is an anchorage in the bay near its north shore, but to reach it a bar with not more than 15 feet on it must be crossed.

From the northern side of Hopkins Point, an ugly shallow bank extends nearly halfway across the bay. The northern part of the shore is gradually rounding, and then nearly straight to Baptist Island with shallow water fringing it with a width of 200 yards.

Baptist Island is small and conspicuous when seen from the direction of Cape Hurd. It lies 100 yards off a sharp point, and 2 miles 296° (NW. by W. $\frac{1}{4}$ W.) from Hopkins Point. Shoal water extends 200 yards south, and 440 yards west-southwest of it.

Baptist Rock is a small spot with 18 feet over it lying south-southwest of Baptist Island. There are two other spots between this and the point, with 19 feet on them.

Arbutus Rock, small, with 17 feet least water on it, lies $1\frac{1}{4}$ miles southwestward from the most southerly part of Cape Hurd. Another small rock with the same depth over it lies nearly $1\frac{1}{4}$ miles southward from the same part of the cape.

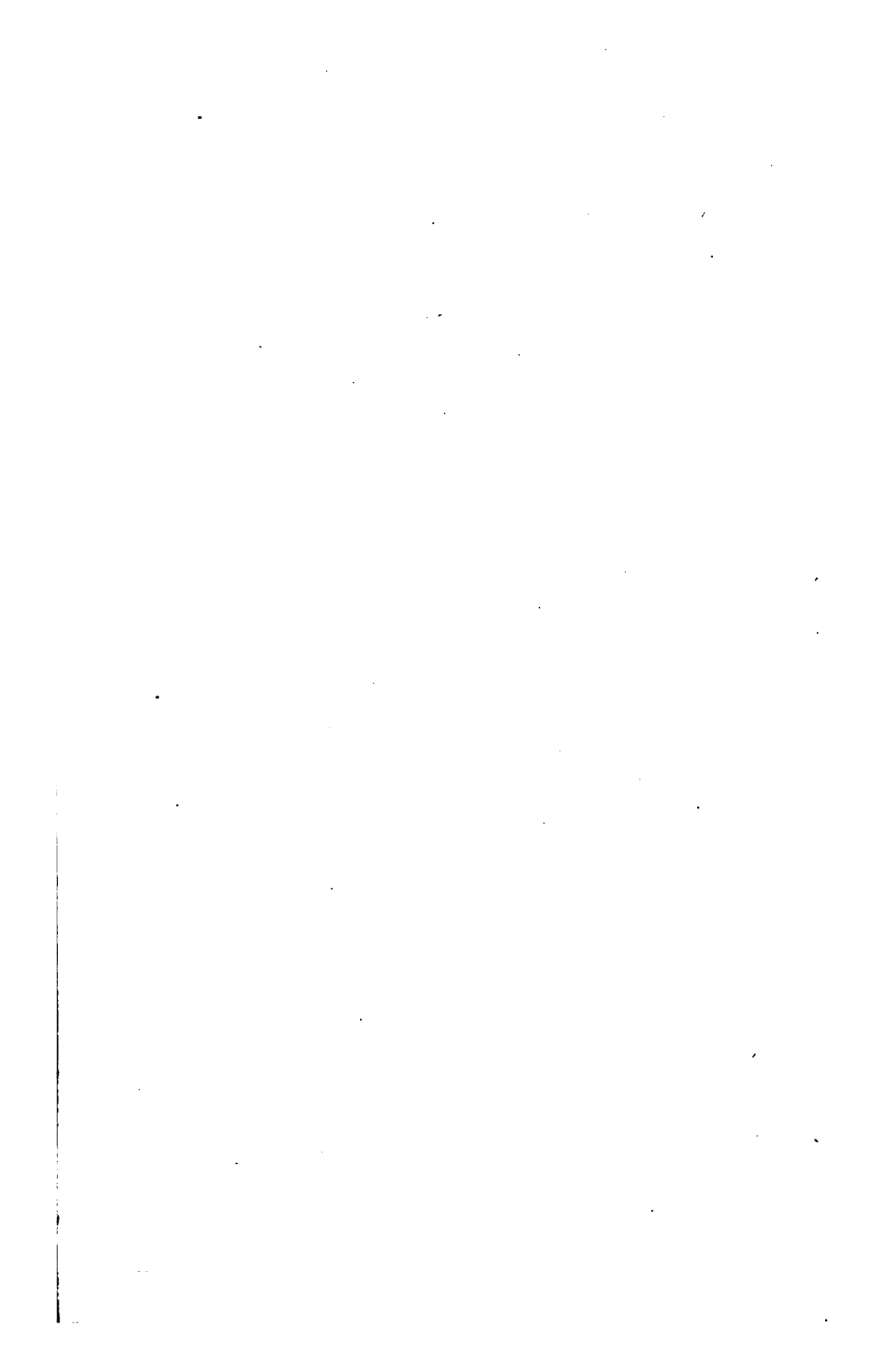
Baptist Harbor (Pilot Cove) is a small, narrow area in the bottom of the bay nearly 1 mile north-northeast of Baptist Island, and nearly $1\frac{1}{4}$ miles east-southeast of Cape Hurd. The shore of the bay between Baptist Island and Cape Hurd is broken into several small shallow coves and low points, and has shallow water extending nearly 590 yards from it.

Into Baptist Harbor only 10 feet can be carried through a narrow channel that should be buoyed before using. Anchorage for a short vessel and perfect shelter may be had just inside the mouth.

Cape Hurd is very low and covered with a small growth of trees. The water off the cape is good outside a bank 300 yards wide.

Caution.—In thick weather or at night do not shoal to less than 10 fathoms when off Cape Hurd.

For further description of Cape Hurd see Chapter V.



CHAPTER V.

LAKE HURON—ENTRANCE TO GEORGIAN BAY.

The low water of 1895 (579 feet above mean tide at New York) was 4 feet below the datum used in this chapter.

General description.—The entrance to Georgian Bay from Lake Huron extending in a general east-northeast and west-southwest direction, is about 20 miles long and varies, from 20 to 40 miles, in width.

It includes the area between the northern side of Saugeen Peninsula, from Cape Hurd to Cabot Head and southeastern side of Manitoulin Island, from Hungerford Point to Cape Smith and contains many islands and shoals having one principal channel and several minor channels between them.

The plan of this chapter is to describe the northern shore of Saugeen Peninsula with all off-lying islands and dangers south of Main Channel, then the southeastern shore of Manitoulin Island with all off-lying islands and dangers, and last the Main Channel.

Northern shore of Saugeen Peninsula.—**Cape Hurd**, the western extremity of Saugeen Peninsula, is low, flat, and covered with small timber. Between Cape Hurd and Cove Island (described later) there are four channels which in good weather may be navigated in daytime.

The 15 fathom curve lies about 4 miles westward of Cape Hurd.

Long Point.—From Cape Hurd the shore trends $1\frac{1}{2}$ miles northeasterly to Long Point with shoal water extending from it an average distance of $\frac{1}{4}$ mile; to pass northwestward of which, keep the center of Doctor Island in range with the middle of Flowerpot Island, 43° (NE. $\frac{3}{4}$ E.). Long Point is a reef 2 feet above water, lying on the south side of the mouth of Ragged Bight. Between the shoal water off this reef and that from Bonnet Island there is a channel of 12 feet into Ragged Bight, westward 590 yards from Long Point is a rock with 12 feet of water on it.

Southeast Bank is a large area of shoal water extending northward from the shore between Cape Hurd and Long Point. This bank, with only 3 feet water on it in places, is $1\frac{1}{4}$ miles long north and south, being connected with the shallow bank from the Saugeen Shore by a disjointed bar of rocky patches, over which not more

than 16 feet water (in low stages there may be 4 feet less) can be relied on when taking Cape Hurd Channel.

Two isolated shoals, with 16 and 13 feet on them, respectively, lie near the western edge of the bank.

Ragged Bight is 1,320 yards long, about as broad, and full of sunken rocks. There is, however, between them deeper water through which a fishing boat may pick her way to two well-sheltered narrow coves on the southern shore.

Bonnet Island, so named for its clump of dark-tinted trees somewhat resembling a plume, is small, and, with the point close off which it lies, divides China Cove on the north from Ragged Bight on the South.

China Cove, an indentation lying between Bonnet Island and Wreck Point, is full of obstructions.

China Reef extends 880 yards in a southwesterly direction from Wreck Point, with 5 to 12 feet water over it, and narrowing the channel between it and the southeast edge of Devil Island Bank to 200 yards. The last-mentioned range leads northwestward of the reef.

From Wreck Point the coast trends in a northerly direction 590 yards, then easterly 1,320 yards to Lighthouse Point.

Two shoals with less than 6 feet over them lie close to this stretch of coast.

Tobermory Harbor, is situated at the northwestern extremity of Saugeen Peninsula, and contains perfect shelter from all winds. It consists of Eastern and Southwest arms, the latter extending a little over 880 yards in a southwesterly direction from Lighthouse Point with an average breadth of 100 yards. The low limestone shore sinks down almost perpendicularly 7 or 8 fathoms, which depth over soft mud will be found all over this arm, excepting near the bottom, where a muddy flat extends 120 yards to the depth of 18 feet.

The harbor being too narrow for vessels to lie at single anchor conveniently, they are compelled to make fast to the shores in Southwest Arm; to facilitate this ringbolts have been placed in the rock, and floating booms placed to keep the vessels off the sharp edges.

As there are no dangers in the approach to Tobermory Harbor, it may, when the light is visible, be approached with confidence day or night.

The narrowness of Southwest Arm, together with the prevalent westerly winds, renders it difficult for a sailing vessel to get far in, but by keeping on a good press of sail she may forereach sufficiently far to get temporary shelter, warping up if so desirable.

Eastern Arm.—From North Point shoal water extends 70 yards southwestward, and thence to Rixon Rock in Shoal Bight; vessels

proceeding to Eastern Arm should therefore give it the necessary berth.

Middle Point is the name given to the land dividing the two arms, and on the eastern side of it is an indentation known as Fisherman Cove. From this cove shoal water extends halfway across Eastern Arm, but may be avoided by favoring the eastern shore.

Tobermory Harbor Light, fixed red, 40 feet above water, visible 8 miles, is shown from a white, hexagonal wooden structure on Lighthouse Point.

Fog signal.—The fog signal is made on a hand horn.

Storm signals are displayed from a mast erected on the high ground about midway between Eastern and Southwest Arms.

Radio.—There is a radio station on North Point, Tobermory Harbor. The two masts, 185 feet high and about 150 yards apart, together with the dwelling house and office of the staff, are conspicuous; the call for this station is V.B.D.

North Point, which forms the northeast entrance point of Tobermory Harbor, is steep-to on its north and west sides.

Dunks Point lies about $1\frac{1}{2}$ miles eastward of North Point and forms the northwestern point of Dunks Bay. It consists of two small islets just separated from the main shore, and from them rocks extend northeastward 100 yards. This point marks the western termination of the deeper water of Georgian Bay. For nearly 1,180 yards west of this point the shore is fringed with low dry rocks, which are steep-to.

Dunks Bay, lying southward of the point, is divided into two parts, each of which contains shelter, from westerly and northwesterly winds, in 4 to 7 fathoms, sand. The bottom of the northern arm is about 1,320 yards from Tobermory Harbor.

Driftwood and Little Coves are situated $1\frac{1}{2}$ and 3 miles, respectively, southeastward from Dunks Point, affording shelter for boats from westerly winds.

Overhanging Point is a cliff with a projecting apex 90 feet high 2 miles eastward of Driftwood Cove. The water is especially deep close to this part of the coast, there being a depth of 80 to 90 fathoms at 880 yards, and 40 fathoms 200 yards from the shore.

Cave Point, $2\frac{1}{2}$ miles southeastward of Overhanging Point, is so called from the number of small caverns in its cliffy face, is 140 feet high, presenting the most conspicuous coast feature between Cabot Head and Tobermory. One mile westward of Cave Point occurs another white patch in the face of the cliff.

Loaf Rock is an immense block of stone 50 feet high lying at the water's edge 2.3 miles eastward from Cave Point. A conspicuous landslide on the face of the cliff is situated nearly midway between Rocky Bay and Loaf Rock.

Rocky Bay is situated 4 miles eastward of Loaf Rock and derives its name from the shoal water which extends 440 yards from the beach with a depth of 9 feet.

Cabot Head, which forms the northeastern extremity of Saugeen Peninsula, may be easily identified by three limestone cliffs, Boulder, Middle, and West Bluffs, the last of which is 310 feet high. The eastern one, Boulder Bluff, has a huge moss-covered stone near the edge.

Cabot Head Light, group flashing white, 80 feet above water, visible 14 miles, is shown from a white, square, wooden tower, on the cliff 590 yards east of the Wingfield Basin. (See light list.)

Fog signal.—The fog signal is made on an air diaphone.

Storm signals, visible from all points of approach by water, are displayed from a steel skeleton tower 60 feet high situated 80 feet southwestward from Cabot Head Lighthouse.

Cabot Head Shoal, with $3\frac{1}{2}$ fathoms of water, is the shoalest of a rocky bank extending in a northeasterly direction for nearly $1\frac{1}{2}$ miles from the entrance of Wingfield Basin.

Wingfield Basin is a circular, well-sheltered harbor, 440 yards in diameter, having 12 to 21 feet, mud and rock, situated between Boulder and Middle Bluffs. The entrance, 350 feet wide from shore to shore, is obstructed by a bar of stones, over which was originally a depth of 5 feet. A channel with a width of 75 feet, and depth of 16 feet at low stages, has been dredged across the bar, leading to the west entrance point. The bar is about 80 yards wide with deep water close to its northern side.

Wingfield Basin Range Lights—**Front Light**, fixed white, is shown from a white, narrow, wooden structure, on the south side of the basin.

Rear Light, fixed white, is shown from a similar structure 50 yards, 173° (S. $\frac{1}{2}$ E.) from the front light.

Buoys.—The entrance to the cut is marked on the western side by three; and the eastern edge of the inner end by two, black spar buoys.

Directions.—To enter Wingfield Basin keep at least 440 yards from the shore until the light beacons are in range, when proceed in with them so, passing east of the red and west of the black spar buoys. When through the cut haul sharply to the westward where the best water will be found.

Islands, shoals, and channels between Saugeen Peninsula and Main Channel.—A rocky patch, $1\frac{1}{2}$ miles long and the same distance wide at its widest part, having a least depth of 42 feet, lies 2 miles westward of Cape Hurd.

Southwest Bank is somewhat oval shaped, with its greatest diameter 1 mile in length, northeast and southwest. It had, in 1885.

depths on it varying from 9 to 18 feet. Owing to the remarkably uneven character of the rocky bottom of this and all the other large reefs in this vicinity, and the possibility of there being in some places less water than here given, they should not be crossed by the smallest craft (fishing boats excepted), for in the event of a vessel grounding she would probably remain, owing to the almost daily prevalence of southwesterly winds and consequent sea.

It is separated from Middle Bank by a channel having a depth of 6 to 9 fathoms and 440 yards wide in its narrowest part; but from the absence of any conveniently situated conspicuous natural features on Saugeen Shore no leading mark can be given to guide a vessel through. The same remark applies to what is practically a continuation of this channel, viz, the deep water separating Devil Island and Southeast banks. North and south entrance points of Tobermory Harbor in range bearing 66° (ENE. $\frac{3}{4}$ E.) lead to Devil Island Channel southward of Southwest Bank.

Buoy.—A black spar buoy is placed in 5 fathoms, marking the southern extremity of Southwest Bank.

An isolated shoal, with 27 feet on it, lies about 590 yards south of the bank.

Clearing marks.—The southeast sides of the Otter Islands in range 40° (NE. $\frac{1}{2}$ E.) lead southward of Southwest Bank to Devil Island Channel.

Devil Island, lying $1\frac{1}{2}$ miles 344° (N. $\frac{3}{4}$ W.) of Long Point, is about 440 yards in diameter, has quite an irregular shore line, and is surrounded by shoal water, leaving no passage for a vessel between it and Russel Island.

Devil Island Bank is an extensive area of shoal water stretching to the west-northwestward for 880 yards, where there is a depth of 12 feet called the Spur. The bank extends 440 yards also southward of the island with less than 6 feet water on it, and, eastward, it continues over 1,320 yards with less than 18 feet water on it, and in some places is dry.

Buoy.—A red spar buoy is moored in 5 fathoms on the west edge of the Spur, and in the narrowest part of Devil Island Channel.

Earls Patches is the name given to two spots with 5 feet water over them occupying the eastern portion of Devil Island Bank.

Clearing marks.—A vessel may pass southeastward of these patches and the whole of the bank by keeping the center of Doctor Island under the middle of Flowerpot Island, bearing 44° (NE. $\frac{1}{2}$ E.).

Devil Island Channel is the passage separating Middle and Southwest Banks on the west from Devil Island and Southeast Banks on the east, and its navigation is assisted by red spar buoys on Russel Reef and the Spur, and a black spar buoy on Southwest Bank.

This channel is recommended only for vessels of light draft and mariners possessing local knowledge. All others should use main channel.

. **Directions.**—In taking Devil Island Channel from Lake Huron, Baptist Island (situated $1\frac{1}{2}$ miles southeastward of Cape Hurd) should be kept closed with the point near which it lies, bearing about 114° (SE. by E. $\frac{1}{4}$ E.) until the southeast sides of Otter Islands are in range, bearing 40° (NE. $\frac{1}{4}$ E.) when they may be steered for on that bearing. As the Otter Islands are close together and much alike in color and shape, it is worthy of note that when on the necessary range a single tree (1885) on the eastern extremity of North Otter becomes conspicuous.

Just before the northwestern extremity of Saugeen Peninsula comes in range with the southern side of Russel Island, North Otter should be closed a little, to pass rather farther westward of the Spur than this leading mark would do, although it does not pass over less than 5 fathoms if continued. When the inner side of North Point of Tobermory Harbor is in range with the southern end of Russel Island, bearing 85° (E. $\frac{1}{4}$ S.), the Spur is passed. The channel leading mark should, however, be kept on to lead westward of Russel Reef, until Dunks Point appears in sight north of Russel Island bearing 93° (E. $\frac{1}{4}$ S.), when a vessel may haul eastward.

Another and, to a vessel from the southern part of Lake Huron, more convenient leading mark for Devil Island Channel is White Rock and Williscroft beacons in range bearing 14° (N. by E. $\frac{1}{4}$ E.). When the southeast sides of the Otter Islands are in range, proceed as before directed.

Russel Island is the largest of the three islands which lie between Saugeen Peninsula and Cove Island. The passage between it and Doctor Island is good, with the exception of a rock with 12 feet water on it lying 200 yards off a projecting point in the middle of the southeast side of Russel Island. This shoal may be avoided by keeping the east side of Flowerpot Island closed with the west side of Doctor Island 54° (NE. by E. $\frac{3}{4}$ E.). The northern side of Russel Island is steep-to, but from the two islets which form the northwestern extremity a dangerous ledge of rock, Russel Reef, extends.

Russel Reef extends from the islets above mentioned in a westerly direction 880 yards, and has depths from 6 to 18 feet.

Buoy.—A red spar buoy, marking the west edge of Russel Reef, is moored in 5 fathoms.

Clearing marks.—To clear the north side of it keep Dunks Point in sight north of Russel Island 93° (E. $\frac{1}{4}$ S.) and to pass northwestward of it keep the southeast sides of Otter Islands touching 40° (NE. $\frac{1}{4}$ E.). On the east side of Russel Island is a well-sheltered cove having in it a depth of 6 feet.

Doctor Island, lying between the northern extremity of Russel Island and Tobermory Harbor, has deep water close to all but its northeast side, whence a reef extends 100 yards.

Middle Island, small and round, lies between Flowerpot Island and Tobermory Harbor $1\frac{1}{4}$ miles 223° (SW. $\frac{3}{4}$ W.) from the southern extremity of the former. It is steep-to on all sides.

Flowerpot Island derives its name from two remarkable isolated rocks 250 yards apart, close to the eastern shore. The northern and taller one is about 50 feet in height, and both being much eroded at the bases, with a few small trees on their summits, much resemble gigantic flowerpots. They will probably at no distant day, be undermined by the action of the waves, and suffer the fate of the third which fell a few years ago.

The Castle is the name given to a detached cliffy portion of this island at its northeastern extremity, elevated 200 feet.

A spit extends 200 yards from the southern point of the island, and a bar of rocks lies across the mouth of Beachy Cove on the southeastern side of Flowerpot Island. Elsewhere, the island may be approached to 100 yards, and in some places closer.

Flowerpot Island Light, fixed white, 88 feet above water, visible 15 miles, is shown from a white, square, wooden structure, with a red lantern on the roof, on the northeastern point of the island.

Fog signal.—The fog signal is made on an air diaphone.

Bears Rump is an island having somewhat the outline of that animal. Its northeast end is faced by a steep cliff 80 feet high, the summit of the island being considerable higher. The southwest side is low, and from it for 440 yards extends a reef known as Bears Rump Shoal.

Bears Rump Shoal—Bell buoy.—From the low southwestern side of the island shoal water extends 590 yards and is marked by a bell buoy painted black.

Clearing marks.—To pass south of this reef keep Cove Island Lighthouse shut in with the northeast end of Flowerpot Island, 283° (WNW. $\frac{1}{4}$ W.) an especially good mark at night. With the wind scant from the south, a sailing vessel may edge along the south side of this shoal as long as Echo Island is behind the northeastern point of Flowerpot Island 272° (W. $\frac{3}{4}$ N.), but on the first appearance of the former she should tack. The northwest side of Doctor Island touching the southeast side of Middle Island 243° (WSW. $\frac{1}{8}$ W.) leads southeastward of this shoal; and to pass northwestward of it keep the same part of Doctor Island in one with the southeastern side of Flowerpot Island 235° (SW. by W. $\frac{1}{4}$ W.).

Brown Ledge, a patch having a least depth of 33 feet, lies $1\frac{1}{2}$ miles from the southern extremity of Bears Rump Island.

A patch with a least depth of 18 fathoms lies $1\frac{1}{2}$ miles westward of Bears Rump Island.

Cape Hurd Channel.—Between Southeast and Devil Island banks on the northwest and the shoal bank extending from Saugeen Peninsula on the southeast there is a passage by which 16 feet water may be carried. (In low stages there may be 4 feet less.)

This channel is recommended only for vessels of light draft and mariners possessing local knowledge. All others should use main channel.

Directions.—In taking this channel from the southwest, Baptist Island should be kept closed with the point near which it lies 114° (SE. by E. $\frac{1}{4}$ E.) until the center of Doctor Island is in range with the middle of that portion of Flowerpot Island seen clear of the Saugeen Peninsula bearing 44° (NE. $\frac{1}{4}$ E.). When the marks are exactly on, the highest tree on Doctor Island will fit into the hollow near the middle of Flowerpot Island, and a small portion of the latter will be behind the northwestern extremity of Saugeen Peninsula.

Proceed past Cape Hurd with this leading mark on, reducing speed and keeping the lead going. When 1 mile past Cape Hurd the water will deepen to 6 or 7 fathoms. As soon as Gat Point of Cove Island comes in range with the southwestern side of Devil Island bearing 325° (NNW. $\frac{1}{2}$ W.), a vessel should haul westward to bring the same part of Doctor Island under the center of the whole of Flowerpot Island in order to lead more fairly between China Reef and Earls Patches. When Gat Point touches the south side of Russel Island bearing 314° (NW. $\frac{1}{2}$ W.) these dangers will be passed and Doctor Island may be left on either side.

To lead westward of the shoal water lying between Cape Hurd and Gat Point of Cove Island keep the summit of Lucas Island in range with or open west of Gat Point, bearing 5° (N. by E.).

In thick weather, or at night, the reefs just described should not be approached to a less depth than 20 fathoms.

Cove Island, $2\frac{1}{2}$ miles long northwest and southeast, having a greatest width of 2 miles, lies with its southern extremity 5 miles 4° (N. $\frac{1}{4}$ E.) from Cape Hurd. It is very irregular and has shoals on the southwestern side.

Northeast shore of Cove Island.—In marked contrast to the Lake Huron side of this island, the former is entirely free from dangers.

Tecumseh Cove is a snug little cove with a depth of 5 fathoms over clay, situated 1,320 yards northwestward from Northeast Point. Either in this cove, or in the mouth of it, a small steamer may find in 12 to 14 fathoms water temporary shelter from southeasterly to northerly winds, through west.

Eagle Cove is the next small bay northward of Tecumseh Cove.

Eagle Point, bluff and steep-to, is situated halfway between North Otter Island and Cove Island Lighthouse. In the large bight formed between Eagle Point and North Otter Island vessels may find shelter from southerly and westerly winds in 16 fathoms over sand and mud, 880 yards from shore. A sailing vessel should not anchor nearer Cove Island than this distance, so that in the event of a shift of wind northward, a common occurrence, she may have good room wherewith to get underway; more especially as the water does not materially lessen in depth until 200 yards from this shore. This remark applies equally to the soundings between Eagle Point and Cove Island Lighthouse.

Gig Point is the northeastern extremity of Cove Island.

Cove Island Light, flashing white, 90 feet above water, visible 15 miles, is shown from a white, circular, stone structure, on Gig Point.

Fog signal.—The fog signal is made on an air diaphone.

Note.—In 1914 each blast terminated in a very pronounced grunt in a lower note, and was heard distinctly from Flowerpot Island.

Rock.—Northeastward 200 yards from the lighthouse is a small rock 2 feet high, which, as well as the remainder of Gig Point, may be approached to 100 yards. Close southward of the lighthouse is a landing jetty.

Reported shoal.—A shoal, with a least depth of 21 feet, is reported to lie 1.6 miles 306° (NW. $\frac{1}{4}$ W.) from Cove Island Light.

Northwest shore of Cove Island.—This stretch of shore between Gig and Gat Points is fairly bold to, being at the same time fronted by a large bank, known as Cove Island Ground, with depths varying from 5 to 10 fathoms over rocky bottom. The lighthouse, kept well open of Gap Point, leads northwestward of the shoal water extending in a southwesterly direction 300 yards from Gat Point.

Cove Island Light and Whistle Buoy, showing an occulting white light, is moored in 140 feet, $6\frac{1}{2}$ miles 274° (W. $\frac{1}{4}$ N.) from Cove Island Lighthouse.

A whistle is sounded by the motion of the waves.

Southwest shore of Cove Island.—This coast from Harbor Island to Gat Point (the narrow west extreme of Cove Island) is broken up into a number of bights and small islands, fringed with shoal water for a distance of 440 yards.

Gat Point Reef, with depths on it varying from 4 to 15 feet, extends south-southwest a little over 590 yards from the point of that name. A patch with 15 feet of water on it is situated south by west a little over 880 yards from Gat Point.

Clearing marks.—To pass westward of both these reefs, keep the whole of Yeo Island open westward of Lucas Island, 10° (N. by E. $\frac{1}{2}$ E.) and to lead southwestward of it keep the northern extremity of

Russel Island in range with southern end of Turning Island, bearing 114° (SE. by E. $\frac{1}{4}$ E.).

The southeast side of Cove Island, from Northeast Point, is fringed with low dry rocks, and some just covered, as far as the Gut into Cove Island Harbor. This fringe extends 100 yards from the shore, but is steep-to.

Middle Bank, on the eastern portion of which there was in 1885 but 4 inches of water, lies northeastward of Southwest Bank, being separated therefrom by a passage 200 yards broad known as Macgregor Channel. Middle Bank under the depth of 3 fathoms is $1\frac{1}{4}$ miles long, west-northwest and east-southeast, by 1,320 yards wide.

Northwest Bank is the nearest to Cove Island, lying with its eastern extremity westward nearly $\frac{3}{4}$ mile from White Rock. It is $1\frac{1}{2}$ miles long, east and west, by a little over 1 mile in breadth, with depths on it varying from 7 to 15 feet.

Clearing marks.—Dunks Point, touching the southern side of Turning Island 102° (ESE. $\frac{3}{4}$ E.) leads north of this bank. The summit of Lucas Island in range with the southwestern extremity of Cove Island (Gat Point) bearing 5° (N. by E.) leads westward of it.

North Channel is the passage between Northwest Bank and Cove Island, and if the directions given are exactly followed very good water may be carried through it; but on account of several isolated patches, with 15 to 21 feet of water on them, one range only will not suffice to take a vessel in unless of very light draft. These huge lumps of sunken rocks are situated between the eastern edge of Northwest Bank and Turning Island, rising abruptly from the bottom with deep water between them.

Directions for North Channel.—When approaching Gat Point of Cove Island bring the north end of Russel Island in range with the southern extremity of Turning Island, bearing 114° (SE. by E. $\frac{1}{4}$ E.) Keep this range on, which will lead south of Gat Point Shoals and north of Northwest Bank, until White Rock Beacon comes exactly halfway between the southern end of Russel Island and the northern point of Devil Island, 140° (SE. by S.). Steer now for White Rock Beacon on this range until the southern end of South Otter Island appears in sight southeastward of Turning Island, bearing 71° (ENE. $\frac{3}{4}$ E.), when a vessel may haul eastward into the bay.

Harbor Island, round and conspicuous, is situated $\frac{3}{4}$ mile northwestward from Turning Island (later described); between them the shore is foul.

Harbor Reef, with 2 feet water over it, extends from this island in a northwesterly direction $\frac{1}{4}$ mile.

Cove Island Harbor, the entrance to which is situated $\frac{1}{4}$ mile eastward of Harbor Island, is 350 yards long by 200 yards broad; in 1885, 12 feet water was carried in, and perfectly sheltered anchorage had, in from 15 to 18 feet muddy bottom. The approach is not inviting to strangers, on account of Harbor Island reef and the shoal water which nearly meets it from Channel Point on Cove Island.

Between these reefs, however, there is a passage 100 yards in width, through which 4 fathoms may be carried by steering for the west entrance to Boat Passage just open, bearing 86° (E. $\frac{1}{4}$ S.) until the southern end of Russel Island is a little northward of the southern and bare point of Turning Island, bearing about 145° (SSE. $\frac{1}{4}$ E.). This range should be kept on, with a depth of 15 feet, until White Rock Beacon is seen east of Harbor Island.

The shoal water will now be passed and the entrance to the harbor may be steered for, keeping midway between the land on either side. Upon arriving at the narrows keep in the middle until the harbor begins to open, when, to avoid a rocky spit with 9 feet water over it on the starboard hand, keep sufficiently near the north-west shore to close Bar Point.

Boat Passage is a narrow channel separating the group of islands containing the harbor just described from the main portion of Cove Island.

The Gut, through which a boat may carry 5 feet of water, is the name given to a break in the shore 30 feet wide, communicating with Cove Island Harbor.

A rock with 12 feet on it lies 150 yards off the Gut, to clear which keep the channel between North and South Otter islands closed. Hence to Turning Island the shore is bold-to.

Turning Island is the most southerly part of the broken-up portion of Cove Island. Three rocks, with 6, 10, and 15 feet water over them, lie, respectively, 590, 440, and 1,180 yards westward from the southern point of Turning Island.

Clearing marks.—To pass eastward of these rocks keep the southern extremity of South Otter Island open south of Turning Island bearing 71° (ENE. $\frac{1}{4}$ E.).

To pass southward of these rocks keep White Rock Beacon midway between the southern end of Russel Island.

White Rock, so-called from a collection of small white bowlders on its summit, is 3 feet high, and has deep water close to it on all but its southwestern side, whence a rocky spit makes off 150 yards.

Beacons.—A white beacon, 14 feet high and having a triangular cap, is located on White Rock.

A white beacon, with a rectangular top and 24 feet high, is on Williscroft Island, which is 880 yards 14° (N. by E. $\frac{1}{4}$ E.) of White Rock.

These in range bearing 14° (N. by E. $\frac{1}{4}$ E.), assisted by buoys, lead through Devil Island Channel.

Greenfield is a circular reef, 200 yards in diameter, with 3 feet water on it, situated $\frac{1}{2}$ mile southward of Turning Island.

Clearing marks.—To pass northward of this shoal, keep the inner part of North Point of Tobermory Harbor in range with the northern side of Russel Island bearing 107° (SE. by E. $\frac{1}{4}$ E.) The eastern side of Echo Island in range with the northwestern side of North Otter Island 40° (NE. $\frac{1}{4}$ E.) leads east. Dunks Point in range with the northern end of Russel Island 93° (E. $\frac{1}{4}$ S.) leads both south of this shoal and White Rock Spit, but across a patch with 21 feet over it. There is deep water between Greenfield and White Rock.

Otter Islands are separated from Northeast Point of Cove Island by Otter Island Channel, which has deep water, with the exception of a small rock with 10 feet on it, lying 100 yards westward of North Otter, and nearly 100 yards northward from its southwestern extremity. To pass through this channel, keep the eastern side of Echo Island in range with the northwestern extremity of North Otter Island bearing 40° (NE. $\frac{1}{4}$ E.).

Between the two Otter islands themselves 18 feet can be carried by keeping the northwest fall of Flowerpot Island 68° (ENE. $\frac{1}{4}$ E.) in range with the southeastern point of North Otter Island (trees, not the shore). This mark leads close to the northern extremity of South Otter, in order to avoid the spit from the southwest point of North Otter Island. The remaining sides of Otter islands are steep to.

Echo Island, 140 feet high, situated nearly 2 miles westward of Flowerpot Island, has the same character as Middle Island.

Macgregor Channel extends in a northeasterly and southwesterly direction between Northwest and Middle Banks and Turning and Russel Islands and has a least depth of 6 fathoms.

It is only recommended for vessels of light draft and mariners possessing local knowledge. All others should use Main Channel.

Directions for Macgregor Channel.—This channel may be taken from Lake Huron by bringing White Rock Beacon exactly under the center of that part of Flowerpot Island, which is visible clear of South Otter Island, bearing 70° (ENE. $\frac{1}{4}$ E.). This leading mark should be kept on until Dunks Point appears in range with the northern side of Russel Island 93° (E. $\frac{1}{4}$ S.) The latter range will lead a vessel of light draft eastward into the bay; but as it crosses a patch with 21 feet on it, lying $\frac{1}{2}$ mile southward of White Rock, Dunks Point should, as soon as seen, be again closed until this patch is passed, when it may be again opened, or kept in range with the

northern end of Russel Island 93° (E. $\frac{1}{4}$ S.) to lead north of Russel Reef. Or the White Rock Beacon and Flowerpot Island range may be continued, passing westward of White Rock and its spit by giving it a berth of 200 yards.

Southeastern shore Manitoulin Island—Hungerford Point.—

This most southern extremity of Manitoulin Island may be known by its small white stony beaches. Scattered stones and shallow water extend from this point and from the shore westward of it for 440 yards, leaving a fairly steep shore between Hungerford Point and Owen Island Bank for 590 yards.

Owen Island is 200 yards long north and south and separated from the Manitoulin shore by a similar distance. It is the only small island on either shore of Owen Channel, and therefore easily recognizable.

Owen Island Bank, with depths varying from 12 to 18 feet, extends on all sides from Owen Island; the depth of 13 feet being found at 1,180 yards east of the southern extremity, and the same depth 440 yards southward of the same. This bank renders the shore of Manitoulin Island shoal for over 1,320 yards from Owen Island toward Georgian Bay, and the same distance in the direction of Lake Huron.

East-northeast, nearly 1,180 yards from the southern point of Owen Island, is the southern end of a rocky spit having 7 feet water on it, extending 440 yards from the shore abreast.

The shore from a point 1 mile northeastward of Owen Island trends in a northeasterly direction for $5\frac{1}{2}$ miles to Red Cliff Bight. It is steep-to and bordered by highlands, White Cliff and Little Bluff being the principal ones.

A shore bank, 1 mile long and extending $\frac{1}{4}$ mile from the shore, lies $1\frac{1}{2}$ miles northeastward of White Cliff. It has about 6 feet of water on the northern end and 12 feet on the southern.

Another bank, 440 yards wide, fronts the shore for $1\frac{1}{2}$ miles south-eastward of Red Cliff Bight.

Red Cliff Bight, 1,320 yards wide at the entrance and $\frac{1}{4}$ mile deep, is shallow and unfit for anything but boats. It derives its name from a low earth cliff of that color.

Tamarac Point is a headland separating a cove of that name from Red Cliff Bight.

Tamarac Cove runs in north of Tamarac Point 880 yards, but on account of there being only 6 to 7 feet water, and that over a rocky bottom, it is only fit for boats. From the southwest part of Tamarac Point the coast is again steep-to for a little over 2 miles as far as the southern point of Shallow Cove, from the north point of which a shoal extends southward 590 yards. From the northern point of Shallow Cove the coast continues foul to the extent of 300 yards

as far as the last of these indentations known as North Cove. Hence, to within $1\frac{1}{4}$ miles of the turn in to James Bay, the straight shore may be approached to 200 yards.

Horsburgh Point is the southern entrance point of James Bay; the point has good water on the northeastern side, but from the east side for $1\frac{1}{4}$ miles southward of the turn in to James Bay shoal water extends offshore 300 yards.

James Bay is a wide-open indentation with a sandy beach 1,320 yards broad; the shore of the bay is shallow, not more than 12 feet being found at $\frac{1}{4}$ mile therefrom. On the northern side of the bay is snugly situated the Indian village of Wekwemikongsing. The church stands upon the rising ground $\frac{1}{2}$ mile back from the village, and is conspicuous from the bay.

Church Hill.—Northwestward $\frac{3}{4}$ mile from the church is a hill 300 feet high, rendered conspicuous by its steep fall to the northeast and long slope in the opposite direction.

From the eastern part of the point separating the two portions of the settlement a shoal with 9 feet on it makes off in a south-southeast direction, 300 yards, to avoid which keep the southern point of Squaw Island open of the Manitoulin shore, bearing 50° (NE. by E.). A vessel may find a berth with southwesterly and northwesterly winds, in 4 fathoms over sand in the middle of James Bay, with Lonely Island Lighthouse a little open of Horsburgh Point, and South Point of Squaw Island touching the Manitoulin shore. The bight north-eastward of the houses is foul, and from the northeast point of this bight the coast line is unbroken for $2\frac{1}{4}$ miles to the south low Clay Cliff, and may be approached to 200 yards.

Clay Cliff is a remarkable bank of white clay and gravel, 250 feet in height, which, with the lower cliffs of the same character on either side of it, presents a conspicuous object to the mariner.

From these cliffs shoal water extends for 440 yards and so continues for 3 miles, until 590 yards from an isolated patch of dry stones known as the Nest. Hence, to the northeastern extremity of Cape Smith, described in chapter XIV, the shore may be approached to 200 yards.

Islands, shoals, and passages between southeastern shore of Manitoulin Island and Main Channel—Stewart Rock, with 4 feet water on it, lies 590 yards northwestward from Channel Rock. From Stewart Rock the bank continues in a southwesterly direction 880 yards, with a depth of 12 to 18 feet.

Ship Bank is an extensive piece of shoal ground lying southwestward of and separated from Stewart Rock by a narrow lane of 4 fathoms. The least water on Ship Bank is 10 feet (1885). The length of the shoal under the depth of 18 feet is nearly 1,320 yards

northeasterly and southwesterly, by 590 yards in breadth. A patch of 4 fathoms lies 350 yards north-northwestward from the northwestern angle of Ship Bank.

Pope Rock, with 4 fathoms water over it, forming the northern end of a bank over 1 mile long within the depth of 10 fathoms, is situated 2 miles westward from the north point of Wall Island and $1\frac{1}{2}$ miles eastward of the shore of Manitoulin Island.

Fitzwilliam Island, $8\frac{1}{2}$ miles long northwest and southeast and 4 miles wide, lies $1\frac{1}{2}$ miles southeastward of Manitoulin Island. The southwestern shore is very irregular and fronted by reefs and islands; the other shores are more regular and not nearly so foul.

Southwest shore of Fitzwilliam Island.—This coast from Indian Harbor Point takes a general northwesterly direction nearly $2\frac{1}{2}$ miles to Perseverance Island. It is broken up into several open, deep bights, studded with rocks, and offering no shelter to vessels.

Emily Maxwell Reef is an extensive rocky shoal extending 1 mile from the point nearly midway between Indian Harbor and Perseverance Island. This shoal, in 1885, had 4 feet water upon it.

Clearing marks.—The southwestern point of Flowerpot Island in range with the southwestern point of Yeo Island 130° (SE. $\frac{1}{2}$ S), leads southwest of this shoal also. The west point of Perseverance Island in range with the fall of Manitoulin Island to Lake Huron, bearing about 2° (N. $\frac{1}{4}$ E.) leads westward of Emily Maxwell Reef.

Perseverance Island is 880 yards long in an east-northeasterly direction, and quite narrow, and from the southwestern extremity shoal water makes off 440 yards. From Perseverance Island the coast of Fitzwilliam Island trends $2\frac{1}{2}$ miles northeastward to Phoebe Point.

Phoebe Point, which may be considered as the southeastern entrance point of Owen Channel. Between them is a large and shoal indentation known as Wild Bight. From Phoebe Point the coast continues east-northeast $2\frac{1}{2}$ miles to Beach Point, the terminus of the shallow water of Owen Channel on the Fitzwilliam Island side.

Little rock, with 13 feet water on it, is a small patch lying $1\frac{1}{2}$ miles north-northeast from the southwestern extremity of Perseverance Island. A rock with 16 feet water on it lies 1.6 miles 3° (N. $\frac{1}{4}$ E.) from the same island. These are the shoalest outlying spots between Perseverance Island and Phoebe Point. Shoal water extends from the latter to the depth of 21 feet west-southwest over 590 yards.

Channel Rock, 6 feet above the water and sufficiently separated from the shore of Fitzwilliam Island as to render it conspicuous, is situated $\frac{1}{2}$ mile northeastward from the northern part of Phoebe Point. Between the latter and Channel Rock shoal water extends 300 yards from the shore.

Beach Point of Fitzwilliam Island derives its name from the fact of its being the northeasterly termination of a long stony beach, with four small sharp points of rock jutting out on it. This point is important as being the boundary between the shallow and deep waters on this side of Owen Channel.

Beach Point Flat is an extensive rocky bank with 12 to 15 feet over it, fronting the beach just alluded to. It commences at Beach Point, and its northern edge runs westward 1,180 yards. Thence under the name of the Ridge it joins Owen Island Bank with 17 feet of water (at low stages there may be 4 feet less). The northeastern side of the Ridge rises abruptly from a depth of 10 fathoms. The edge of Beach Point Flat stretches 440 yards off the southwestern end of the beach whence it derives its name. Hence it continues almost straight to Channel Rock.

The northern shore from Beach Point trends easterly $2\frac{1}{2}$ miles to Rattlesnake Harbor. This shore is quite regular and has few off lying shoals.

Rattlesnake Harbor.—The northern entrance point (called Rattlesnake Point and marked by fishing huts and ice houses) of this excellent harbor is situated a little over 1,320 yards southwestward from Northeast Point. It contains shelter from all winds in 3 to 5 fathoms over mud.

Little Island, upon which is situated a fishing station and a large ice house (1885), is a good mark in approaching the harbor. Little Island and the shore of Fitzwilliam Island for 440 yards westward of it should not be approached nearer than 300 yards; thence to Beach Point the shore is steep-to. A narrow ridge of dry stones extends from the island east-northeast 200 yards; from the end of these stones shoal water continues in a northeasterly direction 200 yards. The dry stones at the southwestern extremity of Little Island are separated from those lying off the coast of Fitzwilliam Island by a narrow boat channel, with a depth of not more than 6 feet.

From Rattlesnake Point a spit extends in a westerly direction, 200 yards, leaving a passage between it and the shoal water from Little Island before alluded to, 300 yards in width, through the middle of which 18 feet was carried into the harbor in 1885.

Northeast Point is the northeastern extremity of Fitzwilliam Island.

Northeast Point Reef.—From Northeast Point a shoal with 6 to 15 feet of water over it makes off in the same direction over 440 yards.

Wall Island lies with its low narrow southern extremity a little more than 1 mile north-northeastward from Northeast Point. It is over 1,320 yards long in a north by east direction with a greatest width of $\frac{1}{2}$ mile near its north end. Deep water skirts its north and east sides, except off the small bay about the middle of the west side.

The Wall.—From the southern end of Wall Island, a reef named The Wall on account of the steepness of its eastern side, extends southward nearly $1\frac{1}{4}$ miles. It is a very dangerous reef, having 7 feet water (in low stages there may be 4 feet less) near its southern end. A detached spot of $3\frac{1}{4}$ fathoms lies 590 yards east-southeastward from Northeast Point.

Clearing mark.—The east fall of the Cape Smith land in range with the eastern extremity of Rabbit Island 15° (N. by E. $\frac{1}{4}$ E.), leads 880 yards eastward of The Wall.

On the west side of Wall Island are two small islets, separated from the main island by a distance of 200 yards.

West Flat.—From these two islets, sunken rocks and shoal water extend $\frac{1}{4}$ mile, to pass northward of which keep the whole of Club Island open north of Wall Island 105° (ESE. $\frac{1}{4}$ E.). Northeast Point, touching any part of Flowerpot Island (when visible), leads westward of this shoal.

Wall Island Channel is the passage with depth of 4 to 5 fathoms between The Wall and Northeast Point Reef. As no conspicuous natural objects present themselves in the direction of this channel, no single range can be given by which a vessel can be guided through. The best available mark for a vessel taking this channel from the south is, before passing northward of the high land near Rattlesnake Harbor, to bring Church Hill (James Bay) over the western extremity of Wall Island (not the islets), bearing 2° (N. $\frac{1}{4}$ E.). Keep this mark on until Little Island near the entrance to Rattlesnake Harbor comes in sight north of Northeast Point, bearing about 246° (WSW. $\frac{1}{4}$ W.), when haul westward. The vessel's speed should be reduced and the lead kept going.

Rabbit Island, situated $4\frac{1}{2}$ miles southward from the entrance to James Bay, may be approached on its northwestern, northern, and eastern sides to 100 yards; but from the southwestern low coast an extensive bank spreads out.

Rabbit Island Bank.—Half a mile west-southwestward from the western point of the island there are only 7 to 9 feet of water, while from the southeastern extremity it runs off equally shoal to southward 440 yards.

A patch, with 15 feet over it, is situated 1 mile southwestward from the western extremity of Rabbit Island. Another spot, with $3\frac{1}{4}$ fathoms on it, lies west-southwest 1 mile from the same extremity.

Clearing marks.—South Point of Club Island open south of Erie Shingle, 140° (SE. by S.), crosses Rabbit Island Bank southwestward of these patches with 4 fathoms. Northeast Point of Fitzwilliam Island, in range with the very western extremity of Wall Island, 188° (S. by W. $\frac{1}{4}$ W.), leads westward of these shoals, with $4\frac{1}{4}$ fathoms.

Owen Channel is the passage into Georgian Bay from Lake Huron, between Manitoulin and Fitzwilliam Islands, being in the narrowest part $1\frac{1}{2}$ miles wide from shore to shore.

Directions for Owen Channel.—In approaching this channel from the western or northwestern parts of Lake Huron, bring the north fall of Fitzwilliam Island (near Rattlesnake Harbor) in range with the eastern part of Beach Point, bearing 78° (E. $\frac{1}{4}$ N.). The range leads through North Passage (as the deep water between Ship Bank and Hungerford Point is called) as far as Beach Point, with 7 fathoms in North Passage, 5 fathoms southward of Owen Island Bank, and across the Ridge with not less than 17 feet (1885).

If wishing to proceed along the southeastern coast of Manitoulin Island a vessel may haul northward off the leading mark as soon as the southwestern end of Perseverance Island is in range with Phoebe Point, bearing 210° (SW. $\frac{3}{4}$ S.).

South Passage of Owen Channel divides Stewart Rock from the shallow coast of Fitzwilliam Island, its least breadth being 350 yards and depth 4 fathoms.

To take this passage from Lake Huron, bring the southern extremity of Wall Island trees in range with Beach Point of Fitzwilliam Island, bearing 62° (ENE.). Keep this range, crossing the bank extending southwestward from Stewart Rock, with 21 feet water, until the southwestern end of Perseverance Island is in range with Phoebe Point, bearing 210° (SW. $\frac{3}{4}$ S.). Keep the latter marks on to cross the Ridge as before directed.

In approaching the entrance to Owen Channel from the southwest, the southwestern extremity of Perseverance Island should not be brought to bear southward of 151° (SSE.) until (if wishing to take South Passage) the mark for that channel comes on, or, if preferring North Passage, until the west side of Owen Island is open the least thing southeastward of the Manitoulin shore, bearing about 50° (NE. by E.). This range should be kept to lead westward of Ship Bank until the regular North Passage leading mark comes on.

In thick weather the southwestern side of Fitzwilliam Island should not be approached to a less depth than 20 fathoms.

Southeast coast of Fitzwilliam Island.—From Indian Harbor Point this coast trends northeast by east $4\frac{1}{2}$ miles to McCarthy Point, for the first half of this distance the shore is steep-to. The remainder is shallow.

McCarthy Point Ledge.—The eastern edge of this danger runs from the point of that name in a general southwest by south direction $2\frac{1}{4}$ miles, where it terminates in a small rocky isolated patch with 13 feet water over it. To pass east of this danger, keep the east fall of Fitzwilliam Island near Rattlesnake Harbor in range with Pavement Point, bearing about 16° (NNE.).

Indian Harbor Point is the southern extremity of Fitzwilliam or, as it is sometimes called, Horse Island. It forms also the southeastern point to Indian Harbor—a boat cove much resorted to by the Manitoulin Indians during the trolling season for trout in autumn. The point in 1885 was well marked by a large stone cairn.

Indian Harbor Reef is a dangerous rocky ledge extending in a southwesterly direction nearly 1 mile from the above-mentioned point, with depths on it varying from 4 to 18 feet.

Clearing mark.—To pass southeastward of this reef with 22 feet (in low stages there may be 4 feet less) water, keep the southern extremity of Club Island a little open southeast of Fitzwilliam Island, bearing 50° (NE. by E.).

McLelan Rock, with 12 feet water over it and lying $1\frac{1}{2}$ miles 204° (SSW. $\frac{1}{2}$ W.) from Indian Harbor Point, is the worst obstruction in Fitzwilliam Channel. It is 300 yards long in an east-northeast direction by 200 yards broad, and the center of the shoal is situated $1\frac{1}{2}$ miles south-southwest from Indian Harbor Point. The passage between this rock and Indian Harbor Reef is 590 yards wide and 7 to 9 fathoms deep.

Smith Rock, a small rocky patch with 3 fathoms over it, lies $1\frac{1}{2}$ miles southward from Indian Harbor Point. A bank with 6 to 9 fathoms joins this and McLelan Rock, from which it is separated by a little over 880 yards.

Manitoba Ledge is a dangerous reef situated westward of Yeo Island, being separated therefrom by a channel with a depth of 7 fathoms, but which should not be attempted by strangers.

This ledge under the depth of 18 feet is 1,320 yards long northeasterly and southwesterly by more than 590 yards broad. The northeastern end with only 1 foot of water on it usually breaks. The southwestern extremity, with 6 feet, lies west by south 1,320 yards from the Knob. The western edge of the bank at the depth of 15 feet is situated west-northwest 1 mile from the same.

Clearing marks.—To pass southwest of this ledge, keep Eagle Point in range with the northern extremity of Gig Point 136° (SE. $\frac{1}{2}$ S.), or if Eagle Point be not easily distinguishable at this distance, keep the northern end of North Otter Island in range with the lighthouse 134° (SE. $\frac{1}{2}$ S.). The latter mark will lead still farther southwestward from Manitoba Ledge.

Yeo Island is $1\frac{1}{2}$ miles long by 1,180 yards in breadth. It has two summits, each about 100 feet high; the northeasternmost, known as Black Summit, falling steeply to the water. The northeast, east, and southeast sides of Yeo Island are fairly steep-to, but from the north gravelly point 200 yards northwest of Black Summit a rocky spit with less than 6 feet over it makes out 440 yards in a north-northeast direction.

Yeo Island Spit—Clearing mark.—To pass northeastward of this spit keep Cove Island Lighthouse in sight (and at night the light) bearing 164° (S. $\frac{1}{2}$ E.).

From the gravelly point the north shore of the island runs westward fairly straight, with deep water for nearly 1 mile. The west or Lake Huron side of Yeo Island is indented by two excellent boat coves. A rock with 7 feet of water over it lies 200 yards off the mouth of the northern cove.

The Knob is an almost isolated bushy lump forming the southwestern point of Yeo Island.

James Island, 9 feet high, is nearly 440 yards long north and south, by half the distance in breadth. Its north side is fairly steep-to, but a rocky ledge extends southwestward from it, with any depth under 15 feet for more than 1 mile.

James Island Reef, as the above shoal is called, has a channel between it and Yeo Island Spit over 1,320 yards in width and 4 to 8 fathoms in depth, to pass through which keep the western extremity of Lucas Island locked with the east point of Yeo Island, bearing about 185° (S. by W.). As alluded to in connection with directions for entering Fitzwilliam Channel, the 51° (NE. by E. $\frac{1}{2}$ E.) course there given should, if made good for 3 miles, lead a vessel through between James Island Reef and McCarthy Point Ledge.

A vessel may haul northward from this course as soon as the east fall of Fitzwilliam Island (near Rattlesnake Harbor) appears in sight and in range with Pavement Point, bearing about 16° (NNE.), and when the northern end of Bears Rump comes in range with the northern point of James Island she may keep eastward if required.

In proceeding into Lake Huron from Georgian Bay by this channel, from the intersection of the two ranges just mentioned (about $\frac{1}{2}$ mile northwest of James Island) steer 231° (SW. by W. $\frac{1}{2}$ W.) for 2 miles. This course ought to bring the west side of James Island in range with South Bluff of Lonely Island, and at the same time the northern end of Flowerpot Island in range with the northern extremity of Yeo Island. Proceed into Lake Huron with the former of these marks on.

The east coast of Fitzwilliam Island from McCarthy Point north-northeastward to the termination of the cliffs may be approached to 200 yards.

Club Island is over $1\frac{1}{2}$ miles long in a north-northeastern direction, with a maximum breadth of over 1,320 yards. The northwest, north, and east sides are fairly steep-to, but from South Point Club Island Ledge extends in a general southwest by south direction, nearly 1 mile, at which distance there is a depth of $3\frac{1}{2}$ fathoms.

Clearing marks.—To pass eastward of this ledge, keep the point of Club Island (north of the harbor) well open east of South Point, bearing 13° (N. by E. $\frac{3}{4}$ E.).

The eastern extremity of Rabbit Island in range with the same side of Erie Shingle, bearing 348° (N. $\frac{1}{2}$ W.), leads west. The southern end of White Cliff (Manitoulin Island) in range with Northeast Point of Fitzwilliam Island 285° (WNW. $\frac{1}{8}$ W.), leads nearly $1\frac{1}{2}$ miles south of Club Island Ledge.

From South Point of Club Island the stony western coast trends in a north-northwest direction, nearly $1\frac{1}{2}$ miles to Back Cove (a shallow indentation into which a boat could carry 6 feet of water in 1885). From this coast of Club Island shoal water extends on an average of a little over 590 yards. From Back Cove the coast trends northeastward a little over 1 mile to its northeast extremity and is steep-to.

Kilroy Patch, $5\frac{1}{2}$ miles 215° (SW. $\frac{3}{8}$ S.) from South Point Club Island, is about 1,100 yards long north and south and 660 yards wide and has a least depth of 34 feet.

Club Harbor, on the eastern side of the island, contains excellent though limited anchorage in $3\frac{1}{2}$ fathoms. The entrance is obstructed by two rocky ledges known as North Reef and South Spit, between which, in 1885, 15 feet was carried in. (At low stages there may be 4 feet long.)

North Reef, with depths varying from 4 to 9 feet, extends 250 yards from the north side of the entrance.

South Spit, with the same depth, makes off 100 yards from the northeast part of Fishery Point (as the south entrance point is called). The western gravelly part of this point is steep to close to the dry stones, and 12 feet water was available in 1885 at a radius of 230 yards from this gravelly point, right around to North Reef. At a greater distance the water rapidly shoals to the shores. The anchorage under Fishery Point is confined to a space of about 6 acres.

Day beacons.—On Fishery Point are erected two white beacons, which in range 233° (SW. by W. $\frac{1}{4}$ W.), lead southeastward of North Reef. On the western shore of the harbor stands a couple more, which in range 261° (W. $\frac{1}{4}$ S.) lead between North Reef and South Spit, with 15 feet (1885). In approaching the harbor, therefore, the back one of the Fishery Point beacons should be kept southeastward of its fellow until the western beacons are in range, when proceed in; turn sharply round Fishery Point and anchor in the middle of the cove, with the entrance points in range.

Erie Shingle is the name of a narrow bank of small stones 7 feet above the water, 300 yards in length in a northwesterly direction.

The northeastern side is steep to, but shoal water extends in every other direction. Westward it makes out a little more than 590 yards, where there is not more than 12 feet. Half a mile southward there is but 15 feet, with 5 feet 440 yards northeast of it.

A detached patch with 16 feet on it lies a little more than 1 mile southwestward from Erie Shingle.

Clearing marks.—To pass westward of Erie Bank, keep Church Hill (James Bay) open westward of Rabbit Island half the breadth of the latter 351° (N. $\frac{1}{4}$ W.). The southern end of Owen Island (Manitoulin), touching the northwestern side of Wall Island, 244° (WSW. $\frac{1}{4}$ W.), leads 440 yards northwestward of it. Lonely Island Lighthouse, well open north of Club Island, the northern point of the latter, bearing 95° (E. by S.), leads north.

Erie Channel is the passage between Club Island and Erie Shingle. Between the shoals on either side it is 880 yards wide, with a depth of 4 fathoms, which will be found when Lonely Island Lighthouse is seen over Back Cove of Club Island. On account of no conspicuous natural objects offering themselves in the direction of this channel suitable for a leading mark, it can not be recommended to strangers. Should, however, a sailing vessel find herself between Club Island Ledge and Erie Bank on the clearing up of a fog and unable to get southward, the following directions will take her through:

Bring the southern ends of Lonely and Club Islands in range 89° (E. $\frac{1}{2}$ S.) and at the same time Horsburgh Point in one with the eastern side of Rabbit Island bearing 356° (N. $\frac{1}{8}$ E.); or, bring the east sides of Rabbit Island and Erie Shingle in range 348° (N. $\frac{1}{2}$ W.), in conjunction with Little Island of Rattlesnake Harbor touching Northeast Point of Fitzwilliam Island. From the first position a 36° (NE. $\frac{1}{4}$ N.) course, and from the last position a 22° (NNE. $\frac{1}{4}$ E.) course will take a vessel through.

Fitzwilliam Channel is the passage between Fitzwilliam and Yeo islands.

Directions for Fitzwilliam Channel.—The best passage through Fitzwilliam Channel is between Smith Rock and Yeo Island, by keeping South Bluff of Lonely Island in range with the northwestern side of James Island bearing 60° (NE. by E. $\frac{1}{8}$ E.). This mark also leads northwestward of Manitoba Ledge, but requires clear weather to discern Lonely Island. When the northern end of Flowerpot Island appears northward of Yeo Island bearing 133° (SE. $\frac{3}{8}$ S.) steer 51° (NE. by E. $\frac{1}{8}$ E.) midway between South Point of Club Island and the northeastern extremity of Lonely Island. This course for nearly 3 miles will lead between James Island Reef and McCarthy Point Ledge.

Clearing mark.—The southwestern point of Flowerpot Island open of the southwestern point of Yeo Island, bearing 131° (SE. $\frac{1}{4}$ S.), leads southwestward of Smith Rock, McLelan Rock and Indian Harbor Reef.

Main channel is the best and safest channel between Lake Huron and Georgian Bay. It lies between Yeo and Cove Islands and has shoals, dangers, and several smaller channels. The directions for main channel are given under the head of the various channels comprising it.

Lucas Island, 100 feet high, is situated $1\frac{1}{4}$ miles 164° (S. $\frac{1}{4}$ E.) from Black Summit, Yeo Island. The western and southern sides of this island are steep to.

Lucas Island Reef, with depths under 6 feet, extends $\frac{1}{4}$ mile in an east-southeasterly direction from the northeastern part of the Island.

Clearing mark.—To pass eastward of this reef keep the east fall of Fitzwilliam Island open the breadth of James Island eastward of the latter, bearing 13° (N. by E. $\frac{3}{4}$ E.).

Moorhouse Patch, having a least depth of 36 feet, lies 2 miles 78° (E. $\frac{1}{2}$ N.) from Black Summit, Yeo Island.

Yeo Channel, the passage between Yeo and Lucas Islands, has a depth of 6 to 9 fathoms, and for a vessel bound to the eastern part of the North Channel from the southern part of Lake Huron is the best and most direct passage into Georgian Bay.

Directions for Yeo Channel.—The range for clearing Gat Point Reef, viz, the eastern extremity of Yeo Island, open westward of the western end of Lucas Island may be continued, bringing the points touching when past Gat Point. This mark will lead between the Sisters and Bad Neighbor. On approaching Lucas Island, pass westward of it—the water is good on that side—and a 37° (NE. $\frac{1}{4}$ N.) course will lead 440 yards eastward of James Island Reef. In approaching this channel from the west, South Bluff of Lonely Island in range with the southeastern point of Yeo Island, bearing 55° (NE. by E. $\frac{1}{4}$ E.), leads southeast of Manitoba Ledge.

Anderson Ledge, the northwesternmost shoal on Great Barrier, has a circular shape, and within the depth of $4\frac{1}{2}$ fathoms a diameter of 1,180 yards. Its shoalest spot of 12 feet bears 93° (E. $\frac{1}{4}$ S.) $1\frac{1}{2}$ miles from the northeastern point of Lucas Island.

Clearing marks.—The southwestern extremity of Yeo Island in range with the northwestern end of Lucas Island 284° (WNW. $\frac{1}{4}$ W.), leads southeast of this shoal spot. The southwestern end of Fitzwilliam Island touching the northeast side of Yeo Island, 311° (NW. $\frac{1}{4}$ N.) astern, leads southwest of it. The south point of Bear's Rump in range with Snake Island bushes, 130° (SE. $\frac{1}{4}$ S.), leads northeast of Anderson Ledge. The south end of Long Beach (Fitz-

william Island), touching the east side of James Island, 5° (N. by E.), leads 1,320 yards westward of this spot of 12 feet.

In thick weather or at night the portion of the Great Barrier northwestward of Confiance Rock should not be approached to a less depth than 10 fathoms. The northeast or Georgian Bay side of the whole of Great Barrier should not be approached under the same circumstances to less than 20 fathoms.

Lucas Channel is the passage between Lucas Island and Anderson Ledge over 1,320 yards wide, with depths varying from 5 to 20 fathoms.

Directions for Lucas Channel.—To pass through this channel from the south, keep the southern end of Long Beach (Fitzwilliam Island) in range with the east side of James Island bearing 5° (N. by E.) until the southeast side of Yeo Island appears end on, bearing 252° (W. by S.), when a vessel may haul northeastward, being well clear of Great Barrier.

Lonely Island is almost circular in shape, with its greatest diameter nearly 2 miles. It lies in a direct line between Cabot Head and Cape Smith; the eastern extremity of the island bearing 339° (N. by W. $\frac{1}{4}$ W.), from Cabot Head, and 159° (S. by E. $\frac{1}{4}$ E.) from Cape Smith. The distance between Cabot Head and Lonely Island Lighthouse is 24 miles; that between Lonely Island Lighthouse and the northeastern extremity of Cape Smith being $16\frac{1}{2}$ miles.

A small landing jetty extends from the point 300 yards northeast of the lighthouse, and 100 yards back of the jetty is the keeper's dwelling.

A bank extends from the north and northeast sides of the island, there not being more than 18 feet at 440 yards. The bight in the south coast is shoal to the line of its points. The remainder of the island should not be approached nearer than 300 yards.

Lonely Island Light, group flashing white, 195 feet above water, visible 20 miles, is shown from a white, octagonal, wooden tower on the summit of the north bluff on the northern side of the island.

Fog Signal.—The fog signal is made on a hand horn, which answers the signals of passing vessels.

Note.—Ice conditions may necessitate this light being extinguished earlier in the autumn than the other lights in Georgian Bay.

West Sister and **East Sister** are the two rocky patches on each of which there is a depth of 21 feet (in low stages there may be 4 feet less). They lie northwest $3\frac{1}{2}$ miles and 4 miles, respectively, from Cove Island Lighthouse.

Clearing mark.—To pass between them and Bad Neighbor, keep Eagle Point of Cove Island in range with the northern extremity of Gig Point, bearing 135° (SE. $\frac{1}{2}$ S.). To pass southward of the

Sisters, bring the south point of Echo Island to touch Cove Island Lighthouse bearing 120° (SE. $\frac{3}{4}$ E.).

Vessels of heavy draft in bad weather should use the latter range, especially as Echo Island is more easily recognized than Eagle Point.

At night Cove Island Light should not be brought to bear southward of 117° (SE. by E.).

Note.—It may be mentioned here that no vessel should rely upon clearing a rock by the single bearing of a light unless her compass is correct or the error on that particular bearing well known. In this connection it may be stated that an excellent opportunity is afforded by a comparison of the ship's course with the correct compass bearings accompanying the many day ranges given in these Sailing Directions whereby the error of the ship's compass on those particular courses may be ascertained.

O'Brien Patch with 5 fathoms on it, lies nearly $2\frac{1}{2}$ miles northwest by west from Cove Island Lighthouse; it is situated on the western part of a bank with $6\frac{1}{2}$ to 8 fathoms over it, 1,320 yards long east and west, by 1,180 yards in breadth. The range of Echo Island and the lighthouse, given above, leads over the northern edge in $6\frac{1}{2}$ fathoms.

Bad Neighbor Rock with 3 feet water over it (at low stages it will be dry), is the worst danger in Main Channel, lying $2\frac{3}{4}$ miles 332° (NNW.) from Cove Island Lighthouse and 169° (S. $\frac{3}{4}$ E.) from the southwest point of Lucas Island.

In addition to this very shoal spot there are two small patches (with 11 feet on each of them) lying 200 yards southwest and $\frac{1}{4}$ mile south by west from Bad Neighbor. In approaching this danger from the east or south in thick weather or at night great caution is necessary, as the whole reef rises abruptly from the bottom on those sides, there being over 40 fathoms at 440 yards and 30 fathoms within 150 yards.

Clearing marks.—To pass southwestward of this rock keep Eagle Point (Cove Island) touching the northeastern extremity of Gig Point, bearing 135° (SE. $\frac{3}{4}$ S.). The eastern extremity of Yeo Island 8° (N. by E. $\frac{1}{4}$ E.) touching the western side of Lucas Island leads west of Bad Neighbor. The same extremity of Yeo Island bearing 345° (N. $\frac{3}{4}$ W.) in range with the other or northeastern side of Lucas Island leads east of it.

From the top of the rock Black Summit of Yeo Island is exactly over and in range with the southwestern extremity of Lucas Island bearing 351° (N. $\frac{1}{4}$ W.).

Buoy.—A spar buoy painted black is moored 440 yards southwestward from the shallowest part of Bad Neighbor.

Hardie Rock.—With the exception of the last mentioned patch of $4\frac{1}{2}$ fathoms, Hardie Rock is separated from Tilton Reef by a depth of 7 to 10 fathoms and a distance of a little over 1 mile. The depth on Hardie Rock is 19 feet, the whole area under the depth of 5 fathoms being 1,320 yards in diameter. From the shoalest part the southwestern extremity of Yeo Island is in range with the northwestern end of Lucas Island bearing 283° (WNW. $\frac{1}{4}$ W.) distant from the latter $2\frac{3}{4}$ miles. A vessel may cross Great Barrier in fine weather on this range, with 19 feet water (in low stages there may be 4 feet less).

Gourdeau Patch is a spot of $4\frac{1}{2}$ fathoms lying $\frac{1}{2}$ mile northwest from the northwestern extremity of Tilton Reef, with 9 to 10 fathoms water between them.

Tilton Reef with depths varying from 11 to 21 feet, is rather more than 1 mile long in a northwest and southeast direction, with an average breadth of 1,180 yards. It is the next shoal northwest of White Shingle Bank, being separated therefrom by a narrow lane of water, with a depth of 5 fathoms.

Clearing marks.—To cross Great Barrier over the western part of Tilton Reef with 21 feet keep the whole of North Otter Island a little open westward of Echo Island, bearing 176° (S. $\frac{1}{4}$ W.). The southwestern extremity of Fitzwilliam Island, in range with the northeast end of Yeo Island bearing 311° (NW. $\frac{1}{4}$ N.), leads southwest, and the south point of Bears Rump, touching Snake Island Bushes 130° (SE. $\frac{1}{4}$ S.), leads northwestward of Tilton Reef.

White Shingle is a collection of stones sometimes 2 or 3 feet above, but in 1884 covered by 1 foot of water. The center bears from Cove Island Lighthouse 60° (NE. by E. $\frac{1}{4}$ E.), distant nearly 4 miles, and under the depth of 4 feet is over 440 yards long in a north-northwesterly direction. At this distance eastward from its center is another shoal spot with 5 feet over it. The whole of White Shingle Bank under the depth of 12 feet is 1,180 yards in diameter.

Clearing marks.—A vessel may stand toward this bank and to the whole of Great Barrier from the southwestward until the southwestern extremity of Fitzwilliam Island is in range with the northeastern extremity of Yeo Island, bearing 311° (NW. $\frac{1}{4}$ N.).

Great Barrier may be crossed between Snake Island Bank and White Shingle by keeping the eastern side of Echo Island in range with the west fall (not the extreme point) of North Otter Island, bearing 216° (SW. $\frac{1}{4}$ S.), with 21 feet.

The west side of Echo Island, touching Northeast Point of Cove Island (Otter Island Channel), bearing 204° (SSW. $\frac{1}{4}$ W.), leads between the same two banks, with $5\frac{1}{4}$ fathoms. Should necessity

compel a sailing vessel to beat through between these banks, the above will serve as tacking marks.

The southern end of Bears Rump, in range with Snake Island Bushes, bearing 130° (SE. $\frac{1}{4}$ S.), leads northeastward of White Shingle Bank and of Great Barrier generally, excepting, of course, Snake Island Bank itself.

A patch of $4\frac{1}{2}$ fathoms lies 590 yards northward from the northern end of White Shingle.

Confiance Rock with 18 feet of water over it (in low stages there may be 4 feet less), lies with its nearest part a little over $\frac{1}{4}$ mile west-southwest from the western extremity of Snake Island Bank. The shoal is 590 yards long, northwest and southeast, and a little less in breadth.

Clearing mark.—The fall of Cabot Head in range with the southwestern extremity of Bears Rump, 109° (SE. by E. $\frac{1}{4}$ E.), leads south of Confiance Rock.

Snake Island is a narrow ridge of small bowlders elevated 5 feet above the bay, and forming the southeastern terminus of an extensive rocky bank on the Georgian Bay side of the entrance.

This narrow dry ridge is nearly 590 yards long, the southeastern end being bare and white, while the opposite extremity had upon it (1885) two conspicuous bushes. Scattered dry stones lie 350 yards northwestward of the latter.

Snake Island Bank under the depth of 18 feet extends westward 1 mile from this bare end of Snake Island, with an average breadth of 1,320 yards.

Halfmoon Island, 12 feet high, is 650 yards long in a northwest direction, and about 100 yards broad. It is composed of small stones, over which grow in two clumps a few small trees. The north and east sides may be approached to 200 yards, but from the east and west points (the horns of the halfmoon) and the shore embraced by them there spreads out southwestward for $2\frac{1}{2}$ miles a large area of shallow water with depths under 10 fathoms, known as Halfmoon Bank.

South Ledge is the dangerously shoal portion extending nearly 1 mile south-southwest from the eastern horn of the island, there being at this distance a depth of $3\frac{1}{2}$ fathoms, and at 1,180 yards from the island only 10 feet.

Clearing mark.—The west side of Lonely Island open east of Halfmoon Island bearing 352° (N. $\frac{1}{4}$ W.) leads eastward of South Ledge.

West ledge, composed principally of stones nearly awash (1885), extends westward nearly 880 yards from the western horn.

In thick weather or at night, approaching from the southwest, the gradual decrease of the soundings will give a good warning of the approach to these ledges, but from the southeast, round eastward to the northwest, a vessel should not shoal to less than 40 fathoms, that depth being found at a little over 880 yards from the ledges.

Flummerfelt Patch lies 3 miles 21° (NNE. $\frac{3}{4}$ E.) from the northeastern extremity of Bears Rump. It is about 1,320 yards long north and south, 880 yards wide, and has a least depth of 36 feet near the northern end.

CHAPTER VI.

GEORGIAN BAY—SOUTHERN PART—CABOT HEAD TO GIDLEY POINT.

The low water of 1895 (579 feet above mean tide at New York) was 3 feet below the datum used for this chapter.

General description.—Georgian Bay is about 126 miles long northwest by north and southeast by south and has an average width of 50 miles except at the ends. The shores of the bay are somewhat irregular; the western and southern are almost entirely free of shoals; the eastern and northern are fronted by shoal water for a good distance. The depths are ample for the largest vessels; nearly all dangers to navigation are suitably marked. Ice, storms, winds, and fogs are treated in previous chapters.

Plan.—The plan of this chapter is to describe the western shore southward from Cabot Head; then eastward along the southern shore; then northward along the eastern shore to Parry Island. For description from Cape Smith to Parry Island see Chapters VIII, IX, and XIV.

Cape Chin, a steep bluff 147 feet high, with scattered burnt trees upon it, is distant nearly $7\frac{1}{2}$ miles southward from the southeastern extremity of Cabot Head. The bight between these headlands is known as Dyer Bay in which the water is very deep, there being over 70 fathoms at 1 mile from the shore. On account of the proximity of the deep water to the coast, a vessel has to be inconveniently close to the shore when anchored for shelter in westerly gales.

Anchorage in Dyer Bay.—The best place to anchor is $1\frac{1}{2}$ miles westward of the mill, and about 440 yards southward of a low earth-cliff, in a depth of 7 fathoms over sand. Here a vessel will find most room to get under weigh with an east wind, and will have shelter from south by east (through west) to north-northeast.

The mill alluded to above is driven by water from Gillies Lake situated on the higher land at the back. There is a small wharf here at which there is not more than 11 feet of water over a very rough bottom. The shores of Dyer Bay are surmounted by a limestone cliff, which near Cabot Head attains an elevation of 235 feet. At Cape Chin itself, the water is not dangerously shoal outside the 150-yard limit.

Darling Reef is a narrow ridge of rock and boulders 440 yards long in a northeast direction. The shoalest spot with a depth of 17

feet (at low stages there may be 3 feet less) on it, lies $2\frac{1}{4}$ miles 53° (NE. by E. $\frac{3}{4}$ E.), from Cape Chin, the nearest land. A bank with less than 10 fathoms on it extends $1\frac{1}{4}$ miles northeastward from the reef, but on the southwestern side the water is very deep, there being nearly 60 fathoms at 300 yards.

Eight Fathom Patch with that depth on it, lies 5 miles 91° (E. $\frac{3}{4}$ S.) from Cape Chin, being separated from Darling Reef by a lane of water 50 to 60 fathoms deep.

Smoky Head.—From Cape Chin the shore trends in a southerly direction 3 miles to Smoky Head somewhat similar in character to Cape Chin. This headland is 172 feet in height, and the water is deep close to it.

White bluff 175 feet high, is so called from the bleached appearance of its limestone cliff; it is situated $3\frac{1}{4}$ miles southward of Smoky Head, and about the same distance northward from the village of Lionhead. The shore between White Bluff and Smoky Head may be approached as near as 100 yards. A depth of 50 fathoms will be found 440 yards from White Bluff.

Whippoorwill Bay is the indentation between White Bluff and the village of Lionhead, and contains shelter from westerly gales. A vessel might lie here with the wind as far round as north, protected by the high land of White Bluff; the great drawback is the depth of water, 14 fathoms being the least a vessel could anchor in to insure swinging clear of the shore.

Lionhead.—The village is situated at the bottom of what is called on the old chart Isthmus Bay; it had in 1903 a population of 445 and contains several churches, the most conspicuous of which from seaward is the Episcopal Church. It has flour, saw, shingle, and planing mills, and a telegraph office, with connection with Wiarton, its nearest banking town, daily by stage coach.

Government wharf.—The harbor, if it can be so called, is about 440 yards square, with general depths of 6 to 10 feet, but with the view of affording shelter from northerly gales, a wharf or breakwater extends southeast by east 150 feet, and then east by north 215 feet farther, from the northwest narrow point. The protected basin in the vicinity of the breakwater has a depth of about 13 feet.

Lionhead Harbor Light, fixed white, 27 feet above water, visible 10 miles, is shown from a white, square, pyramidal tower on the breakwater 27 yards from the outer end.

Buoy.—A red spar buoy marks the extremity of the destroyed portion of the breakwater.

From the village the east shore runs northeast straight for 2 miles to a headland, 168 feet high, of the same name as the village, but on the old chart called Cape Hangcliff. From the eastern part of Lion-

head, a reef makes out $\frac{1}{4}$ mile, and as the bottom is very rough care should be taken to avoid it.

Gun Point is $1\frac{1}{2}$ miles east-southeast from the last-mentioned headland; the shore between should receive a berth of 300 yards. Gun Point is a steep cliffy headland, 181 feet in height, and has deep water close to it.

Jackson Shoal under the depth of 18 feet is an extensive patch nearly 1 mile long in a northerly and southerly direction, and 440 yards broad. Its shoalest spot, with 4 feet of water on it, lies $2\frac{1}{4}$ miles north-northeast from Gun Point, and northeast by east a little more than the same distance from Lionhead. It is connected to both these headlands by a bank on which there is a depth of 6 to 9 fathoms over rocky bottom.

Buoys.—A spar buoy is placed at each extremity of Jackson shoal, the southern being red, and the northern buoy black.

Clearing marks.—To lead southeast of it, no better mark offered itself in 1888 than a tall pine tree at the back of Village Cliff kept in range with Lionhead (the bluff) 236° (SW. by W. $\frac{1}{4}$ W.).

To pass northeastward of this shoal a better mark is Capes Paulett and Dundas in range 153° (S. by E. $\frac{1}{4}$ E.).

To pass southwestward of the shoal, keep King's Point Bluff shut in behind Cape Dundas 139° (SE. by S.).

Barrow Bay.—From Gun Point the coast turns abruptly southwestward, surmounted by a limestone cliff, and with good water close to it, forming the northwest shore of Barrow Bay. At $2\frac{1}{4}$ miles from Gun Point it alters its character to that of a beach which trends southward for $\frac{1}{4}$ mile to the mill.

Cape Dundas, the southeast point of Barrow Bay, is a little over 4.6 miles from the mill. The cape is surmounted by a bluff about 300 feet high, covered with thick timber, offering a contrast to the burned country between it and Cabot Head.

Cape Dundas itself and the coast west of it for 2 miles should receive a berth of 440 yards; the remaining shore of the bay may be approached to 200 yards. From Cape Dundas the shore trends southward $1\frac{1}{2}$ miles to the east point of Jackson Cove.

Jackson Cove.—In this cove and close under its east point will be found shelter from all winds, the only drawback being the great depth of water, a vessel in order to swing clear of the shore having to drop anchor in 13 fathoms over muddy bottom. A stranger having to seek shelter from a northerly gale will find it easier to make this cove and anchor under the point, than to find his way to MacGregor Harbor.

Hope Bay is contained between the east point of Jackson Cove and Cape Paulett, running in from the line of these headlands a little

over 3 miles, and at the bottom of the bay is a sawmill. There is excellent anchorage at the bottom of Hope Bay. One mile in from the point of Jackson Cove is a somewhat similar projection sheltering a small, shallow bay, and from that circumstance named Shoal Cove. This flat does not, however, interfere with the general navigation of the bay, the shores of which, with the exception of the bottom, may be approached to 200 yards. At the bottom the flat makes out 440 yards, at which distance there is 18 feet.

There is a wharf in the southwestern corner of the bay.

Cape Paulett has somewhat the same character as Cape Dundas, but is about 100 feet higher; this broad headland divides Hope and Sydney Bays, and is fringed with shoal water for 250 yards.

Sydney Bay is contained between the last-mentioned headland and the low point known as **Prairie Point** on the east. The western and southern shores of the bay are flat, shoal water extending from abreast the Indian village a little over 440 yards. Outside this bank, however, and in the western portion of the bay under Cape Paulett there is good anchorage and shelter in 4 or 5 fathoms muddy bottom.

Prairie Point already mentioned, has the name which the Indians generally apply to a broad, flat, bare, and low point of this character. It separates the last-mentioned bay from MacGregor Harbor, and has a rocky bank making off its west side 440 yards.

The westernmost of three remarkable limestone cliffs, **Jones Bluff**, 376 feet in height, follows the southeastern shore of Sydney Bay at 440 yards, the road to Wiarton running between the cliff and the shore.

MacGregor (Indian) Harbor is the easternmost of the three arms of the large bay contained between Capes Dundas and Croker sometimes called Melville Sound. Although considerably smaller than either Hope or Sydney Bays, the other two arms, it is an excellent little harbor, affording shelter from all winds under the north-western narrow point called Harbor Point, in 3 fathoms muddy bottom.

Near the shore of the harbor is situated the village of the Cape Croker Band of Indians. The village contains a post office, Methodist and Roman Catholic Churches, situated near the middle of the neck separating the harbor from the water on the southeast side of Cape Croker. A good road connects the village with Wiarton, the nearest railway and telegraph town.

There is a wharf on the northern part of the harbor but only carried out to a depth of 7 feet in 1888 (at low stages there may be 3 feet less). A sand bank stretches out 300 yards from the shore close westward of Harbor Point, there being only 6 feet of water at that distance off the little boat harbor situated 350 yards westward of Harbor Point. A fringe of shallow water also follows the coast

around at an average of 200 yards. Before giving directions for MacGregor Harbor, the coast of the peninsula as far as Montresor Point as well as Barrier Island will be first described.

Pine Tree Point is the most westerly part of the Cape Croker Peninsula, being $1\frac{1}{2}$ miles from MacGregor Harbor, and $2\frac{1}{4}$ miles from Montresor Point.

Lamorandiere Bank.—There is nothing remarkable in the appearance of Pine Tree Point but it is important because of a rocky bank extending nearly 880 yards in a westerly, and 1,320 yards in a southwesterly direction, under the above name. The shoalest part with less than 6 feet on it, lies west-northwest 440 yards from Pine Tree Point. This bank is the worst obstruction in approaching MacGregor Harbor, but may be passed to westward by keeping the cottages on the cliff at the back of the mill in Hope Bay just shut in behind the cliff itself bearing along 222° (SW. $\frac{3}{4}$ W.), but this mark is not easy for a stranger to discern. To pass southward of this bank keep Gun Point and Cape Dundas in range, bearing 307° (NW. $\frac{1}{2}$ W.).

Montresor Point is the old name given to the northern part of that portion of the peninsula separated from the eastern and higher portion by a broad valley running from Cove of Cork Bay to MacGregor Harbor. The point is composed of a light colored earthcliff 86 feet high, and from the shore 200 yards eastward of this cliff a shallow rocky flat extends 440 yards. The shore between Pine Tree and Montresor Points may be approached to 200 yards.

Barrier Island is low and wooded, and 1,175 yards long in a northerly and southerly direction, with an average breadth of 200 yards. Its eastern side may be approached to 200 yards, but its other sides are foul, the western shore being shallow for over 590 yards, while from the southern point a narrow rocky spit makes out in a southerly direction rather more than 440 yards, to clear which keep Cape Croker closed with Montresor Point 81° (E. $\frac{1}{2}$ N.).

Directions for MacGregor Harbor.—If westward of Barrier Island, keep midway between the latter and Cape Dundas, steering toward Cape Paulett to bring Gun Point and Cape Dundas in range 306° (NW. $\frac{1}{2}$ W.). Keep this range astern until within 1,320 yards from the harbor, when keep rather nearer to the southern shore and proceed in. Harbor Point may be rounded close to, and the anchor let go under that point in 16 to 18 feet.

If passing eastward of Barrier Island, the latter may be approached as near as the line of Kings Point Bluff touching Pine Tree Point 160° (S. by E. $\frac{1}{2}$ E.). When Cape Croker touches Montresor Point 81° (E. $\frac{1}{2}$ N.) steer toward Hope Bay to avoid Lamorandiere Bank until Gun Point is in range with Cape Dundas 306° (NW. $\frac{1}{2}$ W.), when proceed as before directed. If from the east, give Mont-

resor Point a berth of 880 yards and steer for the bottom of Hope Bay, keeping the cliff cottage mark on, if visible, and when Gun Point and Cape Dundas are in range 306° (NW. $\frac{1}{4}$ W.), keep them so astern as before directed.

Cape Croker.—This prominent and conspicuous headland is 25 miles southeastward of Cabot Head. The eastern part of the headland is 165 feet above the water, but the most northerly part of the promontory is low. The shore of the latter as well as the higher portion of the cape just alluded to should receive a berth of 440 yards.

Cape Croker Light, group flashing white, 67 feet above water, visible 13 miles, is shown from an octagonal concrete tower with a red cylindrical lantern on the point $1\frac{1}{4}$ miles southeastward from the cape.

Fog signal.—The fog signal is made on an air diaphone.

Cove of Cork Bay.—Between the most northerly part of Cape Croker and Montresor Point, already alluded to, is a large open bight called Cove of Cork Bay, so named from a small boat harbor near the east entrance point of the bay, called by the fishermen Cove of Cork. The bottom of the bay is shoal for 440 yards.

Surprise Shoal is one of the worst dangers in Georgian Bay, lying nearly in the direct track from Cabot Head to Cape Croker, Wiarton, Owen Sound, and Collingwood. It consists of a rocky bank, which under the depth of 10 fathoms is over 1 mile long in an easterly and westerly direction by half that distance in breadth. It has on it three distinct shallow spots, the western one with 9 feet on it (at low stages there may be 3 feet less) being the shoalest, lying $7\frac{1}{2}$ miles 337° (N. by W. $\frac{1}{2}$ W.) from Cape Croker Lighthouse. From this shoalest spot two other shoal heads with 11 and 16 feet on them lie 1,320 yards eastward and 590 yards northeastward. From the 9-foot rock the lighthouse on Griffiths Island is open its own height northeastward of Cape Croker Lighthouse 155° (S. by E. $\frac{1}{4}$ E.).

Caution.—At night, therefore, when the lights are seen in this position, a vessel will be in danger of striking Surprise Shoal.

Light and whistle buoy.—A black, cylindrical buoy, with a skeleton superstructure, showing an occulting white light, is moored in 90 feet off the western end of Surprise Shoal.

Fog signal.—The fog signal is made on a whistle sounded by the action of the waves.

Clearing marks.—In clear weather and daylight, a vessel will pass 1,320 yards outside or eastward of the shoal by keeping the whole of Griffiths Island open eastward of Cape Croker 170° (S. $\frac{1}{4}$ E.), while to pass inside it Griffiths Island (and at night Griffiths Island Light) should be shut in by Cape Croker 154° (S. by E. $\frac{1}{4}$ E.)

A vessel will be southeastward of Surprise Shoal when the southeastern steep fall of Cape Dundas is in range with the northwestern extremity of Barrier Island. The fall of Kings Point Bluff in range with the eastern edge of the clump of trees at the back of Montresor Point, bearing 177° (S. $\frac{1}{4}$ W.), leads west. The course and distance from Cabot Head Lighthouse to Cape Croker Lighthouse is 141° (S. E. by S.) 25 miles, passing $1\frac{1}{2}$ miles inside or southwestward of Surprise Shoal. In clear weather it is recommended to pass inside the danger both by day and night.

Passing Cabot Head Lighthouse at 440 yards, a 144° (SSE. $\frac{1}{2}$ E.) course for $19\frac{1}{2}$ miles, should lead a vessel to a position midway between Surprise Shoal and Barrier Island, a little over 3 miles from each other. If the weather is clear Cape Croker Light should be discernible a little on the port bow a little over 6 miles.

Griffiths Island Light should be visible on a clear night from a height of 30 feet above the water at 19 miles, or 3 miles northwestward of Surprise Shoal; if, therefore, Griffiths Island Light is visible, the vessel must be northward of her intended inside track and in danger of passing over Surprise Shoal.

From Cape Croker to Cabot Head a direct course of 319° (NW. by N.) may be shaped. This course, giving Cape Croker a berth of 440 yards, should lead $1\frac{1}{2}$ miles southwestward of Surprise Shoal, and when the vessel is abreast of the low northern extremity of the cape, the light on Griffiths Island should show signs of closing behind the high northeastern extremity of Cape Croker, and, as before stated, as long as the light remains obscured by Cape Croker a vessel will be southward of Surprise Shoal. The 20-fathom curve encircles Surprise Shoal at 590 yards, while on the southern side there is as much as 10 fathoms 100 yards from the 9-foot and 11-foot patches.

A depth of 32 and 40 fathoms over a mixed bottom of sand, gravel, and reddish clay will be found between the shoal and Montresor Point, the western portion of Cape Croker Peninsula mentioned, and a vessel uncertain of her position in thick weather or at night by not shoaling to less than 50 fathoms will keep at a safe distance from Surprise Shoal.

From Cape Croker Lighthouse the shore turns away southward for over 1,320 yards and then in a general southwest direction for $4\frac{1}{2}$ miles to the Indian village situated round the shore of a bay 1 mile northwestward of Kings Point. At the northern end of this village is a sawmill and wharf (1888) called after Port Elgin on Lake Huron.

Port Elgin Shoal commences at a point 880 yards northward of the mill and runs southward as a narrow ridge until its extremity is 590 yards eastward from the mill wharf. The chimney of the mill in range with the end of the wharf led south of the reef in 1888.

Anchorage.—On the southeastern side of Cape Croker there is good holding ground and shelter from winds from south through west to north, in 7 and 8 fathoms water 300 yards from the shore, with the whole of Griffiths Island open a little eastward of Hay Island; but still better shelter can be had in 4 to 6 fathoms off the road leading across to MacGregor Harbor. The shortest distance across the neck at 590 yards southward of the road is 880 yards.

Kings Point, broad and not very high, is $5\frac{1}{4}$ miles south-southwestward from the east side of Cape Croker, and may be said to form the northwestern entrance to Colpoys Bay, from the bottom of which it is 10 miles. Shoal water extends nearly 440 yards from the northern part of Kings Point, as well as from the shore of the bay westward of it.

Kings Point Bluff, 371 feet high, and very conspicuous from the offing, is a well defined limestone cliff 1 mile in from Kings Point, and with Jones Bluff, $1\frac{1}{2}$ miles northwestward of it, already alluded to, together with Malcolm Bluff, 388 feet high, the same distance southward of it, make three of the most conspicuous landmarks on this part of the shore.

Colpoys Bay is a magnificent inlet running in 9 miles from the southwestern extremity of White Cloud Island, which, together with Hay Island, shelters it from the heavier seas of Georgian Bay. The breadth of the mouth of the bay is 3 miles, and that of the bottom at the town of Wiarton 1,320 yards. It is a fine sheet of water, and with the exception of a sandy flat extending 880 yards from the bottom of the bay, and a bank near the village of Oxenden making out 300 yards, its shores may be approached everywhere to 200 yards, and in some places closer.

The shores are marked by picturesque limestone cliffs 300 feet high at the entrance to the bay, gradually lessening in height as the town of Wiarton is approached.

Anchorage.—There is excellent anchorage in any depth under 10 fathoms from abreast the village of Colpoys to the bottom of the bay, a space $1\frac{1}{2}$ miles in length by over 1 mile in average breadth.

Wiarion.—This town is prettily situated round the bottom of Colpoys Bay. It has a population of about 2,300, and contains churches of all denominations, a bank and telegraph office, and is the present terminus of the Georgian Bay and Lake Erie Branch of the Grand Trunk Railroad.

Government wharf.—This concrete wharf or breakwater 30 feet wide, extends in a southeast by east direction 600 feet, and then turns to south by east for an additional 100 feet. A depth of 18 feet was had at the wharf in 1914; 150 feet southward the depth diminished to 15 feet. At low stages there would be $1\frac{1}{2}$ feet less.

Light.—A fixed red light, 19 feet above water, visible 6 miles, is shown from a mast with a white shed at the base near the outer end of the breakwater at the head of Colpoys Bay.

Storm signals are exhibited at Wiarton, from a mast on the wharf.

Colpoys Village is situated on the western side of the bay and $2\frac{1}{2}$ miles from Wiarton; a small steam sawmill is erected (1888) on the shore, and a vessel may anchor 300 yards off it in 5 fathoms.

Hay Island is thickly wooded, the tops of the trees being about 360 feet above the water, the exposed claybank at the northern end being 120 feet in height. The island is $2\frac{1}{2}$ miles long north and south, with a breadth of $1\frac{1}{4}$ miles. The water is very deep close to the western coast, but from the northwestern extremity shoal water extends 300 yards. The remainder of the coast may be approached to 200 yards. One-fourth of a mile northwestward of South Point a vessel may anchor in 7 to 8 fathoms with good shelter from all winds.

White Cloud Island is separated from Hay Island by a passage a little over 1 mile wide, and a good deep channel $1\frac{1}{4}$ miles wide divides it from the western shore of Colpoys Bay. The coast of the island may be everywhere approached to 200 yards, excepting about North Point, where a shallow rocky flat extends 440 yards offshore.

Kidd Bay is a considerable indentation on the western side, and in which a vessel may find anchorage though the water is rather deep.

Gunderson Shoal is a rocky patch with 18 feet water over it lying $1\frac{1}{4}$ miles west-southwestward from Kidd Point, the southwestern extremity of White Cloud Island.

Cameron Point is the rounding point of the main shore southward of White Cloud Island, and close to which the water is deep. Skinner Bluff, a conspicuous cliff, lies 1,320 yards to the rear of Cameron Point.

North Keppel is the village situated on the shore of Big Bay fronting the gap between White Cloud and Griffiths Islands. There is a wharf here (1888) at which the local steamer calls on her way to Wiarton. It has also post and telegraph offices.

Big Bay.—The shore of Big Bay may be approached anywhere to 200 yards, but a heavy sea rolls in with a northerly wind. The land at the back of the bay gradually rises until it culminates in three hills, the western, Esther Cliff, 372 feet high; the middle, Halliday Hill, of the same height; and the eastern, Dodds Hill, 432 feet high.

Cape Commodore is the gradually rounding point on the eastern side of Big Bay and is really the western entrance point to Owen Sound. A clay bank 144 feet high follows the shore round at 200

yards, and at this distance off the shore a vessel will have good water.

Griffiths Island, $\frac{1}{2}$ mile long, northeasterly and southwesterly by $1\frac{1}{2}$ miles wide and thickly wooded, is separated from Cape Commodore by a deep-water channel 2 miles wide. The tops of the trees give it an elevation of about 300 feet above the water. The northern side of the island should receive a berth of 300 yards, but its other shores may be approached to half that distance.

Griffiths Island Light, fixed white, 85 feet above water, visible 16 miles, is shown from a white circular stone tower on the north-eastern side of the island.

Fog signal.—The fog signal is made on a hand horn which answers vessels' signals.

Anchorage.—On the south side of Griffiths Island a vessel will find good shelter from northerly gales by anchoring in 5 fathoms off the two reddish colored claybanks known as Patterson Cliffs.

Owen Sound.—This fine bay, at the bottom of which is situated the town of that name, is on the line joining Vails Point and Cape Commodore 9 miles wide, and from this line to the town $13\frac{1}{2}$ miles long, gradually narrowing to the bottom. It makes a good and well-sheltered approach to the town in westerly gales, its shores being everywhere approachable to 440 yards, with the exception of Vails and Squaw Points on the eastern side of the sound.

Presqui Isle is a small village on the western shore of the sound, $8\frac{1}{2}$ miles from the entrance to Owen Sound Harbor. On the northern side of the low point, which at one time was no doubt very nearly an island and suggested its name, there is a wharf, along the west side of which vessels in 1888 could find 11 feet (at low stages there may be 3 feet less) of water.

A rocky bank with 9 to 12 feet water on it extends from the extremity of Presqui Isle Point in a northeasterly direction, 440 yards.

Anchorage may be had in 8 to 10 fathoms sandy bottom 880 yards northward of the wharf, but the proximity of the deep water would entail a vessel swinging close to the shore with the wind in.

Between Cape Commodore and Presqui Isle the coast may everywhere be approached to 250 yards.

Vails Point (Point William), is $5\frac{1}{2}$ miles westward of Cape Rich (later described), and 14 miles from the town of Owen Sound, and consists of a gravelly bank 27 feet high.

Vails Point Shoal is a dangerous rocky bank extending 1.3 miles in a west-northwesterly direction from Vails Point, at which distance there is only 8 feet of water, while on the bank there are several spots with less than 6 feet.

Light and Bell Buoy.—A black cylindrical buoy, with a skeleton superstructure, showing an occulting white light is moored in 60 feet $1\frac{1}{4}$ miles 309° (NW.) of Vails Point.

Coffin Hill, surmounted by timber, is a conspicuous feature 354 feet high, 1,320 yards from shore, and 4 miles southwestward of Vails Point. Between the latter and the point abreast of Coffin Hill the shore is foul, and a sailing vessel in beating into the sound should not approach it nearer than 880 yards.

Coffin Cove was formerly a snug little cove for boats, but very little remains of it now but the name. The little point which used to shelter the cove is situated $3\frac{1}{4}$ miles northeastward from Squaw Point, and $2\frac{1}{4}$ miles from the village of Leith.

For 3 miles northeastward of Coffin Cove the shore may be approached to 250 yards, but southwestward of the same cove a shoal bank gradually widens, until off Leith not more than 3 fathoms will be found 440 yards from shore.

Measured Mile.—Between Coffin Cove and Leith are erected two pairs of beacons painted white with the letters M. M. (measured mile) marked on them. These beacons are exactly 1 nautical mile apart.

Squaw Point, low and wooded, is 3 miles from the entrance to the harbor of Owen Sound and half that distance southwestward of the village of Leith. A line joining Squaw Point to Bayview Point on the opposite side may be said to mark the limit of the deeper water of Owen Sound.

Beacons.—Two white beacons stand (1888) on Squaw Point, and in range bearings 208° (SW. by S.) lead along the measured mile.

Squaw Point Shoal takes its name from Squaw Point off which it extends 590 yards, at which distance there is a depth of 9 feet over rocky bottom.

Clearing mark.—The range lights at the entrance to the harbor in range, bearing 195° (S. by W. $\frac{1}{2}$ W), lead well clear of the shoal.

Beacons for ascertaining compass error.—Half a mile southwestward of Squaw Point were erected in 1888 a set of four small beacons painted white for the purpose of testing a vessel's compass. That nearest the shore is surmounted by a plain white triangle, the remaining three back beacons have marked on them in black the letters E., SE., and S. These brought in range with the aforesaid triangular beacon will point out, respectively, the east, southeast, and south magnetic lines corrected to 1914.

A similar set is erected at Sutton Point on the other shore of the sound, indicating the southwest, west, and northwest lines corrected to 1914. Pyette Point and the east side of Griffiths Island in range bear $358^{\circ} 45'$ (N. $5^{\circ} 15'$ E. mag.), while Squaw Point in range

with the point of the east shore under Coffin Hill bear $41^{\circ} 15'$ (N. $47^{\circ} 45'$ E. mag.).

For a vessel with a standard compass so placed that a bearing can be taken all round one range would be sufficient for any direction of the ship's head, but in small vessels with the only compass in the wheelhouse the woodwork of the latter obscures the view, excepting for 2 or 3 points on each side of the bow. It is therefore necessary to point the ship's head exactly for each pair of beacons in range, just keeping steerage way until the course which the vessel makes by her compass is carefully noted.

Steamers belonging to this port would make better courses if their compasses were tested every spring, because from lying so long in the winter at the wharves in Owen Sound Harbor with the ship's head in one direction, and that nearly north or south, a certain amount of temporary magnetism will have entered an iron vessel, causing her to make a different course, probably, to that she made on her last voyage in the previous fall. In addition to the examination in the spring the time would not be thrown away if the compass were again tested in July, by which time the magnetism acquired in the hull of the vessel during the previous winter will have been worked out.

The larger vessels now, however, avail themselves of the services of a compass adjuster, who by means of magnets and soft iron spheres removes the greater portion of the deviation.

Sutton Point is a slight projection $1\frac{1}{2}$ miles southwestward from Sutton Presqu'isle, and marks the southern termination of a low gravelly cliff.

Bayview Point (Balmy Beach), $3\frac{1}{2}$ miles southwest from Sutton Point and 3 miles from the entrance of Owen Sound Harbor, is conspicuously marked by a large summer hotel and cottages. The hotel has a tall square tower, which at night during the visitor's season shows a big group of lamps. Upon its northern side is a wharf with depth of 15 feet. This inconspicuous point has deep water close to it. Close westward of it is a snug little boat harbor, and 440 yards southwest of Bayview Point a stream, Indian Brook, empties.

Brooke, now incorporated with Owen Sound Town, stands on a rising ground on the west side of the sound 1,320 yards northward of the harbor entrance. The Methodist Church with its spire is a conspicuous object.

Owen Sound Harbor.—The entrance to this artificial harbor is approached through a dredged channel over 880 yards long, 200 feet wide, with a depth in 1919 of 19 feet, corresponding to 579 feet above mean tide level at New York. The depth in the harbor was not less.

Range Lights—Front.—A fixed white light, 50 feet above water, visible 12 miles, is shown from a black, square skeleton tower on eastern side of the mouth of Sydenham River.

Rear.—A fixed white light, 92 feet above water, visible 15 miles, is shown from a square, pyramidal skeleton tower 353 yards 195° (S. by W. $\frac{1}{4}$ W.) from the front light.

These in range bearing 195° (S. by W. $\frac{1}{4}$ W.) lead through the dredged cut as far as the outer end of the embankment wall on the northwest side.

Note.—A high brick chimney stands a few feet northwest of the back lighthouse, assisting by day in the identification of the range.

Buoys.—Two black and three red spar buoys mark the southeastern and northwestern sides, respectively, of the dredged channel to the harbor.

Anchorage.—A sailing vessel waiting for a tug to tow her into the harbor will find good anchorage off Brooke in 6 to 7 fathoms, muddy bottom, where with good ground tackle she could safely ride out a heavy northeasterly gale. A stranger with the chart should have no difficulty in navigating his ship as far as the anchorage in any condition of wind or weather.

Directions for entering Owen Sound Harbor.—Before reaching Squaw Point the range lights should be brought in range 195° (S. by W. $\frac{1}{4}$ W.) and so kept until nearly abreast of the outer end of the embankment wall on the northwestern side of the dredged channel situated about 120 yards north of the outer range light, when a vessel should leave the range and steer into the harbor midway between the wharves.

Owen Sound Town is situated on both sides of Sydenham River, which empties into Owen Sound at the head. It is the county town of the county of Grey, and had in 1911 a population of 12,558, including Brooke, now incorporated. The town has a good system of waterworks and is electrically lighted. Supplies of all kinds can be easily had and extensive machinery repairs carried out. The station and yards of the Grand Trunk Railroad are situated on the west side of the harbor and the Canadian Pacific Railroad on the eastern side. Outside the harbor and upon the east side of the sound are the following factories and sawmills, commencing from the northeast: Northern Bolt & Screw Co., Harrison's Tie Mill, Keenan's Woodware, McQuay's Tannery, National Table Co., Rixon & Co.'s Sawmill, Keenan's Sawmill, Canada Heating Co., and the Malleable Iron Works. In connection with these industries, to wharves are erected, at which there was in 1913 a depth of 14 feet.

On the western side of the sound, commencing from the northeast, are the following factories and mills also in operation: Doric Cement

Co., Harrison's Saw and Planing Mills, North American Bent Chair and Furniture Co., Owen Sound Chair Co., Kennedy's Foundry, and Corbett's Foundry.

Owen Sound has steamboat connection with Collingwood, Wiarton, and the principal North Channel ports.

Dry dock.—In 1919 this dock, situated on the western side of the harbor, would accommodate nothing larger than a tug.

Storm signals.—The usual storm warnings are signaled from a mast erected on the western side of the southern part of the harbor.

Pottawatamie River empties into the sound 300 yards northwest of the harbor entrance and can be entered only by boats.

The Claybanks.—From Vails Point, already described, the outer coast runs eastward $5\frac{1}{2}$ miles to Cape Rich, and nearly midway between them is a light-colored conspicuous bank of clay, called The Claybanks (Campbell's Cliff), $1\frac{1}{2}$ miles long, attaining an elevation in its middle part of 370 feet. This feature, together with the high land of Cape Commodore (known as Payette Hill), Griffith's Island, and Cape Croker, render the approaches to Owen Sound unmistakable from the offing. A rocky flat extends from the shore of The Claybanks for 440 yards.

Cape Rich, in contrast to the high land $1\frac{1}{2}$ miles at the back of it, is a comparatively low point, wooded on the western and cleared on the eastern side. On the latter are several deserted houses, formerly occupied by fishermen, but which may again be turned into use for cool weather seekers in the summer. The shores of the cape and bight eastward of it are clean, there being 4 fathoms at 200 yards.

Anchorage in the bight eastward of Cape Rich may be had in 5 to 6 fathoms sandy bottom with shelter from westerly winds, but on account of the probability of the gale veering sooner or later to the north, a vessel should be in readiness to leave on the first sign of such a change.

Twelve Fathom Bank, with least water of that depth, is a broad, rocky rise in the bottom, $3\frac{1}{2}$ miles northward of The Claybanks. The soundings in the locality may be useful in foggy weather to a vessel making Owen Sound from the north or northeast, as between Twelve Fathom Bank and the Cape Rich shore the water again deepens to 20 and 24 fathoms, with sandy bottom, finally shoaling to 10 fathoms over rock and gravel, 1,320 yards off The Claybanks.

From Cape Rich the shore trends in a general south by east direction $7\frac{1}{2}$ miles to Meaford, being fringed with bowlders and shallow water for 200 yards. The land at the back of this stretch rises suddenly to a height of about 400 feet and is partially cleared.

Meaford, which has a population of 2,811, is situated at the mouth of Bighead River, $3\frac{1}{2}$ miles west-northwest from Boucher Point and

7½ miles southward from Cape Rich. The town has the usual stores and churches, the most prominent objects from the offing are the old and new water towers, close together, and the tall brick chimney near the bottom of the harbor. Meaford is the terminus of the Grand Trunk Railroad, affording connection with Thornbury, Collingwood, and the general system.

The country back from Meaford is well settled with farmers, the land being well suited for the cultivation of all kinds of grain and hardy fruits.

Meaford Harbor is the enlarged mouth of the river, protected on its eastern and northern sides by a breakwater running 359° (N. ½ E.) 440 yards from the shore, and thence 500 feet 256° (W. ½ S.), under the name of North Breakwater. From the west it is sheltered by Old Wharf, which runs 500 feet 13° (N. by E. ¼ E.) from the shore. The outer end of Old Wharf is situated about the same distance southeast by south from the light and 230 feet from the nearest part of the East Breakwater. It is proposed to construct a breakwater running out from the land 250 yards northwest of Old Wharf. Its direction will be for the present light, leaving a passage 300 feet wide.

To enter the harbor, pass close westward of the light, and between it and Old Wharf, along both sides of which there is good water. A sheltered space of about 9 acres is dredged to depth of 19 feet (corresponding to 579 feet above mean tide at New York). In the entrance there is a depth of 2 feet more.

A depth of 3 fathoms will be found close northward of the breakwater, but from the point 1½ miles east of the harbor shoal water extends ½ mile, the shore inside this line being foul.

Meaford Breakwater Light, occulting white, 20 feet above water, visible 8 miles, is shown from a black, square, pyramidal skeleton tower on the western end of the breakwater, northern side of the entrance to the harbor.

Boucher Point.—Just west of this small stony projection is a bay 2½ miles wide at the mouth and nearly 880 yards deep, but useless on account of very shallow bowlders.

Lora Bay is a small harbor situated 1½ miles southeast from Boucher Point.

Claybank.—The shore between Meaford and Thornbury is fringed at a short distance back by a conspicuous claybank 150 feet high in places. For 880 yards back from the edge of this bank abreast of Boucher Point the land is flat; it then suddenly rises to a height of over 500 feet, leaving on its western side the valley of Bighead River and on the eastern between it and Blue Mountain a valley down which flows Beaver and Indian Rivers.

Thornbury is situated at the mouth of the Beaver River, $9\frac{1}{4}$ miles west-northwest from Nottawasaga Island Lighthouse. The town has a population of about 1,000 and contains a large flour mill with three black smokestacks conspicuous from the water, the usual churches, schools and stores. It is on the Meaford Branch of the Grand Trunk Railroad. The land behind Thornbury gradually rises till at about 10 miles it is nearly level with Blue Mountain and the high land back of Boucher Point.

The nearly straight shore between Boucher Point and Thornbury is fringed with bowlders and shallow water for $\frac{1}{4}$ mile.

The harbor has an area of about 4 acres, with a depth of 13 feet, and $12\frac{1}{4}$ feet in the entrance channel 100 feet wide corresponding to 579 feet above mean tide at New York. It is sheltered from north-westerly winds by a breakwater extending 500 feet 19° (NNE. $\frac{1}{4}$ E.) and from northeasterly winds by two short piers lying in an approximately southeasterly direction, the latter ends being connected with each other and the shore by a narrow breakwater running 1° (N. $\frac{1}{8}$ E.) 200 feet from the northwestern extremity of the hooked point protecting the harbor from the north. A vessel 150 feet long and 13 feet draft can turn in the harbor. The wharf on the southwestern side of the harbor is 600 feet long, with depth of 13 feet.

Range lights—Front.—A fixed white light, 28 feet above water, visible 10 miles, is shown from a white, square, wooden structure on the west breakwater pier Thornbury Harbor.

Rear.—A fixed red light, 36 feet above water, visible 7 miles, is shown from a mast on the west side of Beaver River 125 yards 214° (SW. $\frac{3}{4}$ S.) from the front light.

These in range lead through the center of the dredged channel to the entrance between the breakwater piers.

Note.—Owing to the outer portion of the west pier being damaged by a storm in December, 1916, the lighthouse was moved back in the line of range 72 feet onto the undamaged portion of the pier.

A rock with 6 feet of water on it lies 200 feet off the end of the northwest breakwater, but the line of the range lights leads southeast of it.

Buoy.—A red spar buoy marks this danger, and a black spar buoy is moored on the east side of the dredged cut, opposite it.

Directions.—To lead through center of dredged channel toward the entrance between the breakwaters, keep the two range lights in range, passing between the two buoys.

Craighleith is a small village on the bay shore $6\frac{1}{2}$ miles southeast by east from Thornbury and 5 miles westnorthwest from Collingwood, but is not very conspicuous from the vessels track. The Meaford Branch of the Grand Trunk Railroad runs through it. A large

area of deep water lies off Craighleith, and inside the shallow Mary Ward Ledges, but as there is no trade it is unimportant. The shore from Thornbury to Craighleith trends nearly straight, and is fringed with shallow bowlders. The 3 fathoms curve approaches the shore to within 880 yards. Off Thornbury the same danger curve is only 300 yards off the end of the pier.

Blue Mountain.—This conspicuous high land reaches to within 1,320 yards of the shore, at that distance west of Craighleith. At its northern edge the mountain has a height of over 800 feet and further inland probably attains a height over 1,200 feet. From the northern point the side of the mountain trends southeast and south, but its height is rendered less conspicuous on account of the land in the valleys rising as it recedes from the bay. On the northeastern side are a couple of remarkable rocky patches, called Cave Cliff and Osler Bluff, 1,045 and 1,075 feet, respectively, above the level of the bay. On the west side there is nothing remarkable.

Between Craighleith and Collingwood the shore trends nearly straight, but is indented with several open, shallow bays and fringed with huge bowlders.

Nottawasaga Island, itself low, but made to appear higher by the trees, is 400 yards long in a northwesterly direction, by 200 yards wide, and the lighthouse on the very northwestern extremity, bears 314° (NW. $\frac{1}{4}$ N.), 2.2 miles from Collingwood Breakwater old lighthouse tower. Shoal water fringes the northeastern side for a width of only 175 yards, but from all other sides shoal water extends long distances, the island being connected to the shore off which it lies 1,320 yards, by very shallow water.

Nottawasaga Island Light, flashing white with a red sector, 86 feet above water, visible 17 miles, is shown from a white, circular, stone structure, on the northern point of the island, about 2 miles northwest of Collingwood Harbor.

Fog signal.—A hand horn is sounded in reply to vessels signals.

Wheeler Bank, with 16 feet least water on its southeastern end, lies 590 yards eastsoutheast from Nottawasaga Island Light. The bank is narrow, and 300 yards long northwesterly and southeasterly.

George Rock has 12 feet least water on its northwestern end, which lies 590 yards eastnortheast from Nottawasaga Island Light. It is also narrow and 400 yards long northwest and southeast.

Buoy.—A red buoy is moored in 24 feet about 220 yards from the rock.

To clear George Rock and Wheeler Bank, keep the elevator its own height open northeast of Breakwater Pier, old lighthouse tower, 144° (SSE. $\frac{1}{4}$ E.). This mark should also be kept on until 2 miles northward of Nottawasaga Island to clear Collins Reef and Stephen Ground.

Mary Ward Ledges.—As all the water for $5\frac{1}{2}$ miles westward and northwestward of Nottawasaga Island is very foul (known as Mary Ward Ledges), only some of the outer shoal spots will be mentioned.

Sandford Ground, with 15 feet least water on it, is small and the northwesternmost of Mary Ward Ledges. It bears 306° (NW. $\frac{1}{4}$ W.), and is $5\frac{1}{2}$ miles from Nottawasaga Island Light.

Hiawatha Bank, small and having 14 feet on it, lies 313° (NW. $\frac{3}{4}$ N), $4\frac{1}{2}$ miles from Nottawasaga Island Light.

Buoy.—A red spar buoy is moored close northward of Hiawatha Bank.

Rowland Bank, with 15 feet least water on it, lies 1,175 yards southsoutheast of Hiawatha Bank.

Thomas Long Shoal, with 6 feet least water on it, occupies the northwestern extremity of the shoaler portion of the Mary Ward Ledges. Its northwest end, with 10 feet least water on it, bears 303° (NW. $\frac{1}{4}$ W.), distant 4 miles from Nottawasaga Island Light.

Dalton Reef, with the same depth on it, is situated on the northeastern edge of the shoaler part of Mary Ward Ledges. It bears 307° (NW. $\frac{3}{4}$ W.), $2\frac{1}{2}$ miles from Nottawasaga Island Light.

Buoy.—A red spar buoy is moored midway between Stephen Ground and Hiawatha Bank buoys and on their alignment.

McCarthy Rock, with 14 feet water over it, lies 2 miles 311° (NW. $\frac{1}{4}$ N.) from Nottawasaga Island Light.

Stephen Ground, with the same depth, lies a little more than $1\frac{1}{2}$ miles 318° (NW. $\frac{3}{4}$ N.) from Nottawasaga Island Light.

Buoy.—A red spar buoy is moored 500 feet northeast of this danger.

Collins Reef, practically dry, is an outer spot on the general bank, and lies 1,175 yards northwest from Nottawasaga Island Light. The shoals about Collins Reef are locally known as the Stags.

Buoy.—A red spar buoy is moored in 4 fathoms of water north of George Rock, 2,300 feet 60° (NE. by E. $\frac{1}{4}$ E.) from Nottawasaga Island Lighthouse.

New Bank, with 23 feet least water on it, is not a very formidable danger, except to a large vessel in a heavy sea. It is situated 6.1 miles 321° (NNW. $\frac{1}{4}$ W.) from Nottawasaga Light. Under 10 fathoms this bank is $1\frac{3}{4}$ miles long in a northwest by west direction, the shoalest spot being near the middle.

Clearing mark.—To pass northeast of all the shoals northwest of Nottawasaga Island, keep the elevator (Collingwood) open northeast of Nottawasaga Island the breadth of the latter, bearing 138° (SE. $\frac{1}{4}$ S.).

Caution.—Vessels should not attempt to pass between the shoals just mentioned and the mainland to southward of them.

Collingwood Harbor.—The entrance to this artificial harbor is situated $24\frac{1}{2}$ miles southeastward from the nearest part of Cape Rich, and nearly 19 miles, 191° (S. by W. $\frac{1}{2}$ W.) from Christian Island (Bar Point) Lighthouse. The harbor is formed by extending piers from the shore, that on the east side running out nearly 1,180 yards in a general northwest by north direction; that on the west side 880 yards in a general northeast direction, inclosing an area of 267 acres, not more than one-fourth of it, however, being of any use to vessels of even moderate draft. Quite a sea rolls in between the breakwaters which are 440 yards apart. The dredged channel, not less than 250 feet wide and 22 feet deep, is marked by buoys.

Lafferty's Home is an important danger lying with its east and shoalest end of 11 feet 1.3 miles 31° (NE. $\frac{5}{8}$ N.) from Collingwood Breakwater Old Lighthouse tower; from the shoalest spot the bank trends northwestward 440 yards to a depth of 17 feet.

Lockerbie Rock, with 15 feet water on it, is situated 590 yards northwest of Lafferty's Home, and $1\frac{1}{2}$ miles 5° (N. by E.) from the breakwater old lighthouse tower.

Light buoy.—A black cylindrical buoy, showing an occulting white light, is moored 24 feet 400 yards 284° (WNW. $\frac{1}{2}$ W.) from the middle of Lockerbie Rock.

Clearing mark.—The north fall of Blue Mountain in range with the south point of Nottawasaga Island, bearing 266° (W. $\frac{1}{2}$ N.), passes 150 yards north of Lockerbie Rock, and 440 yards in the same direction from Lafferty's Home.

A small rock, with 21 feet least water on it, lies nearly 590 yards northeast of Lockerbie Rock. The last clearing mark leads 200 yards southward of this rock.

The Ridge is a narrow bar with depths under 15 feet lying across the entrance to the harbor and through which the present channel has been dredged.

Rocks.—Holland Rock, with 11 feet on it, and Gamon Rock, with 12, are two dangers on the Ridge, lying, respectively, 590 yards and 880 yards, eastward from breakwater old lighthouse tower.

Simcoe Bank is a rocky patch, with a least depth of 25 feet on its eastern extremity, about 1 mile, 337° (N. by W. $\frac{1}{2}$ W.) from Lockerbie Rock.

Lighthouse.—On the eastern extremity of the breakwater or west pier, also called the Dummy, is a white, octagonal, wooden tower, the light having been discontinued at close of navigation in 1916.

Fog signal.—A hand horn is sounded in response to vessel's signals.

Range lights—Front Common Light.—A fixed red light, 29 feet above water, visible 7 miles, is shown from a white, square, wooden structure on the pier at the turn in the dredged channel.

This is the front light for the northwest and south ranges.

Rear South.—A fixed red light, 58 feet above water, visible 8 miles, is shown from a gray, square, skeleton tower, 881 yard, 178° (S. $\frac{3}{4}$ W.) from the front light.

Rear Northwest.—A fixed white light, 34 feet above water, is shown from a white, square, wooden structure, 510 yards, 304° (NW. $\frac{1}{2}$ W.) from the front light.

The front light, in range with the rear south light, leads up to the curve in the dredged channel.

The front light, in range with the rear northwest light, leads from the curve in the dredged channel to the Grand Trunk freight shed wharf.

Anchorage.—As there is no room for anchorage, vessels must tie to the wharves, principally in the southeastern corner, where, with good lines, they are safe in any gale.

Wharves—Depths.—At the elevator the depth is 19 and at the Town and Grand Trunk freight shed wharves 15 feet. A depth of 15 feet can be carried by a dredged cut 100 feet wide to the meat company wharf by passing close south of the common Front Range Lighthouse.

Directions—Collingwood Harbor.—New Bank, with 23 feet water over it (and in low stages there may be 3 feet less), is the most outlying danger for a heavy-draft vessel approaching Collingwood from the northwestward. The course from Cape Croker to a position 440 yards north of New Bank is 126° (SE. $\frac{1}{4}$ E.) and the distance $38\frac{1}{2}$ miles.

From 880 yards off Cape Rich to the same position the course is 115° (SE. by E. $\frac{1}{4}$ E.), and the distance is 17 miles.

From a position 880 yards northeast of Lonely Island Light to the same relative position in regard to New Bank the course is 139° (SE. by S.), and the distance 86 miles.

From a position $3\frac{1}{2}$ miles off the Bustard Rocks main lighthouse, on the line of the Southwest range, the course to a position $1\frac{1}{2}$ miles 13° (N. by E. $\frac{3}{4}$ E.) from Nottawasaga Light, is 156° (S. by E. $\frac{1}{4}$ E.), distance 99 miles.

From Seguin Bank Light Buoy, in the main approach to Parry Sound Harbor, the course to the entrance of the dredged channel is 166° (S. $\frac{3}{4}$ E.), and distance $56\frac{1}{2}$ miles, passing $1\frac{1}{2}$ miles southwest of Western Islands Shoals, and $2\frac{3}{4}$ miles from the lighthouse on Double Top Rock.

From the northeast the course from Campana Shoal Buoy, Christian Island Passage, to Lockerbie Rock Light Buoy is 194°

(S. by W. $\frac{1}{2}$ W.), and the distance $16\frac{1}{2}$ miles. Pass westward of the buoy and proceed as directed below.

From the northwest.—From a position north of New Bank a 137° (SE. $\frac{1}{4}$ S.) course for $6\frac{1}{2}$ miles should bring a vessel to a position with Nottawasaga Light abeam, bearing 227° (SW. $\frac{1}{4}$ W.), distant 1 mile, and Lockerbie Rock Light Buoy that distance ahead. From this position alter course $\frac{1}{2}$ point to the south and steer 143° (SSE. $\frac{1}{4}$ E.) for about $1\frac{1}{2}$ miles, bearing Lockerbie Rock Light Buoy 200 yards on the port hand until the harbor range red lights are in range, bearing 180° (S. $\frac{1}{2}$ W.). This range will lead through the center of the dredged channel to the bend near the common front range red light. The latter light must now be kept in range astern with the back range northwest white light, bearing 306° (NW. $\frac{1}{4}$ W.), which leads to the north corner of the Grand Trunk Railroad Wharf.

In the dredged cut a vessel will have passed westward and south-westward of 6 black spar buoys, and eastward and northeast of 6 red spar buoys.

At night, in approaching Collingwood Harbor from the northwest, keep the common front range light well open northeastward of Nottawasaga Light to clear Mary Ward Ledges. When approaching the dredged cut on the harbor range a vessel will pass into the red sector from Nottawasaga Island Light when about 590 yards from the entrance piers.

Collingwood had in 1911 a population of 7,000, and is the center of a good farming and fruit-growing country. Churches for all the principal religious bodies are to be found here. The town has a good system of waterworks and is electrically lighted. Supplies of all kinds can be easily had. Two branches of the Grand Trunk Railroad System pass through the town. The town being low, none of the buildings except the Grand Trunk elevator, sawmills on both sides of the entrance, and the meat company's buildings on the west side are conspicuous for any distance out in the bay, but its close proximity to Blue Mountain and Nottawasaga Island makes it easily picked up. The three principal steamship lines are the Northern Navigation, the Northern Michigan, and the Goderich Transit.

Storm signals.—The usual storm warnings are hoisted from a mast on the town wharf.

The lifeboat at this port is manned by a volunteer crew.

Shipyard.—A well-equipped yard for the construction of all kinds of vessels and machinery has been established around the dry docks.

Dry docks.—At Collingwood there are two dry docks, the shorter known as No. 2, being 420 feet in length, 95 feet wide, with a depth of $14\frac{1}{2}$ feet on the sill. The other, No. 1, is 514 feet long, 59 feet wide, with $14\frac{1}{2}$ feet on sill (datum 579 feet above mean tide, New York).

Fisherman Point, made conspicuous by the buildings of Collingwood waterworks, is a small point 590 yards east of the elevator, and off which shoal water runs 590 yards under the name of Fisherman Shoal.

One Tree Island, composed of bowlders, small, about 6 feet high, and not at all conspicuous, is situated $1\frac{1}{2}$ miles southeast from Fisherman Point, the shore between having a shallow bank extending 590 yards from it.

Nottawasaga Bay.—The water southeast of the line joining One Tree Island and Gidley Point, is called the head of Nottawasaga Bay. On the above line the deepest water is 30 fathoms, the 10-fathoms curve approaching to within 1 mile of One Tree Island, $1\frac{1}{2}$ miles of Spratt Point, $2\frac{1}{2}$ miles of Yarwood Point, and 1 mile of Gidley Point. Between the 3 and 10 fathoms curves will generally be found good holding ground of sand over mud, though completely exposed to westerly gales.

Nottawasaga Beach.—From One Tree Island the shore trends southeast $4\frac{1}{2}$ miles to the southwest end of Nottawasaga Beach. This stretch of shore is very foul, there not being more than 6 feet of water over bowlders at 250 yards. The 3-fathoms curve, however, approaches the shore at an average of 590 yards.

Nottawasaga River.—The above beach runs in a general northeast by east direction $6\frac{1}{2}$ miles to the mouth of this river. The beach is hard sand, along which is an excellent carriage road. Behind it 200 feet the sand forms a low cliff surmounted by pines. The 3 fathoms' curve skirts the beach at an almost uniform distance of 880 yards, and there are no bowlders upon the bank. The Nottawasaga River is a narrow, fairly deep stream, the last $4\frac{1}{2}$ miles of which flows northeastward parallel to the beach, at an average of $\frac{1}{2}$ mile from it. There is a post office here called Van Black.

Range lights—Front.—A fixed white light, 30 feet above water, visible 10 miles, is shown from a mast on the east side of the mouth of the river.

Rear.—A fixed white light, 41 feet above water, visible 10 miles, is shown from a mast 88 yards 111° (SE. by E. $\frac{1}{2}$ E.) from the front light.

These lights in range lead past the sand bars to the mouth of the Nottawasaga River.

Spratt Point.—From the mouth of Nottawasaga River the shore with a bend 1,320 yards deep, trends northward $4\frac{1}{2}$ miles to Spratt Point. This portion of the shore is fringed for the most part with stones, and shallow water makes off for an average of 880 yards. Spratt Point itself is also stony.

Yarwood Point.—From Spratt Point the clean sandy beach, with scarcely a stone upon it runs north by east 5 miles to Yarwood Point,

taking the form of a slight bay running in 880 yards from the line of the points. This particular part of the shore is well marked by low bare sand bluffs about 25 feet high, and is fringed by shoal water for an average of 590 yards. Shoal water extends 300 yards from Yarwood Point.

Dow Bay is a slight indentation in the shore line, situated $2\frac{1}{2}$ miles north-northwestward from Yarwood Point. Its shore is sandy, but the water is very shoal, making boat landing in a heavy sea rather dangerous. Off the bay shoal water extends 1,175 yards.

Grandolph Bay is the large open space lying between Dow Bay and Tiny Island and fronted by two dry boulder reefs 5 feet high. The 3 fathoms curve is over 1 mile from the bottom of this bay, and, as the bottom is hard, a vessel will find no holding ground anywhere near the shore.

Tiny Island is 2 miles northwest from Dow Bay, small, 25 feet high, and covered with tall dark trees that render it conspicuous. The shore bank with depths under 3 fathoms extends a little more than 1,320 yards from the island.

Tiny Beach is a portion of the shore 1 mile northwest of Tiny Island, and is fronted with sand and shoal water for an average of 880 yards. A ridge 200 feet high skirts the shore about 1,175 yards back from Tiny Beach.

Lafontaine Village is situated 2 miles back and northeastward from Tiny Beach. Its church is often conspicuous from the bay.

Gidley (Cockburn) Point.—From Tiny Beach the northeast shore of Nottawasaga Bay trends northwest by west 3 miles to Gidley Point, which is low, densely wooded, and lined with large outlying boulders. On the south side the 3 fathoms curve approaches to 440 yards of the point, but very shoal water extends double that distance to the northwest.



CHAPTER VII.

GEORGIAN BAY—SOUTHERN PART—GIDLEY POINT TO PARRY SOUND.

The low water of 1895 (579 feet above mean tide at New York) was 2 feet below the datum used for this chapter.

Cedar Point (Old Point Glover) is the northwestern part of the headland lying between Nottawasaga and Matchedash Bays; it is $4\frac{1}{2}$ miles north by east from Gidley Point and $2\frac{1}{2}$ miles northeastward of Bar Point Lighthouse.

A steep cliff, at present covered by trees, surmounts nearly the whole shore from Gidley Point to Cedar Point and the shore is fringed with shoal water for an average of 440 yards.

A shoal with 11 feet of water on it lies with its southwestern extremity 1,175 yards from this shore, 587 yards southeast of the leading mark, and $1\frac{1}{2}$ miles south-southeast from Bar Point Lighthouse.

Marks Point is situated $2\frac{1}{2}$ miles east by north from Cedar Point, the shore between forming a slight bay with shoal water for an average of 100 yards. The land rises in a gradual slope to a considerable height, and is partially cleared by farms and roads.

Thunder Bay is the large and nearly circular indentation contained between Marks and Thunder Points, the latter situated $1\frac{1}{2}$ miles east-southeast from Marks Point.

From Marks Point the shore trends 880 yards southeast and then south by west $1\frac{1}{2}$ miles to the bottom of the bay, which gradually curves and runs in an easterly direction $1\frac{1}{2}$ miles, then northward 1 mile to Thunder Point. The western shore of Thunder Bay is lined by shoal water for only 100 yards, the bottom for about 200 yards, and the eastern shore for 880 yards till Thunder point is approached, whence shoal water lies off only 150 yards.

Anchorage in 4 to 10 fathoms may be had anywhere inside Thunder Bay, but exposed to northerly winds.

Wharves.—On the west shore of the bay are a couple of small wharves, at which vessels drawing as much as 10 feet could (1892) procure a supply of good hardwood.

The land on the west side and bottom of the bay rises gradually from the shore and is partially cleared, with a few farmhouses. The village and post office of Lafontaine is situated southward 3 miles from the bottom of the bay.

Christian Island, lying $3\frac{1}{4}$ miles northwestward of Gidley Point and 2 miles westward of Cedar Point, has an extreme length of 8 miles in a north-northwesterly direction, and a maximum width of $4\frac{1}{2}$ miles. It is the home of a band of Chippewa Indians who do some farming, but the island is for the most part thickly timbered excepting at the village on the southeastern shore.

Daly Point, the northwestern extremity of Christian Island, is situated $2\frac{1}{2}$ miles southwestward from Hope Island, later described; this double point is low and thickly wooded, but half a mile from the end begins to rise.

Rocks.—A rock with less than 6 feet water upon it lies 300 yards west-northwestward from the western prong of Daly Point, and a spit with 13 feet on its outer edge makes out north-northeast nearly 590 yards from the eastern prong of the point.

A rock with 15 feet least water on it lies 1,320 yards north by east from the latter; as little as 10 feet was reported in this locality, but a diligent search failed to find any trace of such a shoal, although the water was very clear.

Clearing marks.—To pass between the rock with 15 feet on it and the spit from Daly Point, keep Giant's Tomb Island Light-house touching Motton Point, Beckwith Island bearing 93° (E. $\frac{1}{3}$ S.).

North Watcher Island Tree in range with Hardhead Point, bearing 60° (NE. by E. $\frac{1}{3}$ E.), leads northward of both spit and 15-foot rock.

Quai des Roches is a pile of stones lying $1\frac{1}{2}$ miles southward from Daly Point, the coast between being lined with large outstanding boulders, and from the Quai itself they are distant 200 yards. A rock with less than 6 feet water lies 880 yards northwestward from Quai des Roches, and inside it there is barely passage for a boat.

Hayter Point is situated a little over 3 miles southward from Daly Point, and between the former and Quai des Roches is a large open shallow bay lined with large boulders, which also extends 200 yards from Hayter Point.

The 3-fathom curve skirts this coast at an average of 880 yards, and very shallow water will be found close inside of it. A rock with 11 feet water lies 1,175 yards northwest by north from Hayter Point and is the outermost shoal off the coast.

Little Island, 5 feet high, is situated over $2\frac{1}{2}$ miles south-south-eastward from Hayter Point, and between them the coast turns gradually, forming an open bay full of shoal water and stones, the bottom of the bay being well marked by a bare sand cliff about 30 feet high. The 3-fathom curve is only 200 yards from the northern half of this part of the coast, but from the bottom of the bay it is 1,175 yards, with 10 feet close inside it. Little Island from the

southeast has the appearance of a boat under sail, and the 3-fathom curve is only 100 yards outside the island.

Stony Island, 5 feet high, so named from the great number of stones surrounding it, lies 200 yards from the coast to which it is joined by stones nearly $2\frac{1}{2}$ miles southeastward from Little Island. The coast between is nearly straight, the 3-fathom curve following it at an average distance of 200 yards.

Christian Island Light, fixed white, 61 feet above water, visible 15 miles, is shown from a white, circular stone structure on Bar Point, the southeastern extremity of the island.

Fog signal.—A hand foghorn is sounded in response to vessels' signals.

The shore trends nearly straight from Stony Island to the lighthouse, and the detached stones off the shore disappear before Bar Point is reached.

The Bar.—The broad bank under the depth of 3 fathoms connecting the southeastern extremity of Christian Island with the mainland is known as the Bar. Its southwest and irregular edge runs from Stony Island southeast by south toward Gidley Point, while its northern and nearly straight edge trends from the lighthouse east-southeast $1\frac{1}{2}$ miles to the mainland, the western portion rising abruptly from a depth of 10 fathoms.

Excepting Campana Shoal and some shoal spots about 587 yards from the mainland the whole flat is nearly level, and 16 feet can be carried over it.

A rock, with only 6 feet of water on it, lies 440 yards southeastward from the lighthouse.

Buoy.—A black spar buoy marks the east side of this rock.

Campana Shoal, with 10 feet least water on it, is a very dangerous obstruction to the navigation of this channel. The shoal is small and composed of a pile of bowlders. It lies nearly 1 mile 168° (S. $\frac{1}{2}$ E.), from Bar Point Lighthouse.

Buoy.—On this shoal is moored a red and black horizontally striped spar buoy.

Clearing marks.—In the absence of the buoys the following clearing marks will be found useful in taking this passage.

The east side of Hope Island in range with Menague Point, bearing 355° (N. $\frac{1}{2}$ E.) leads eastward of Bar Point Spit.

Variation and Cedar Points in range bearing 27° (NE. by N.) lead southeastward of Campana Shoal.

Little Island in sight bearing about 307° (NW.) leads southwest of Campana Shoal.

Caution.—In thick weather or at night do not shoal to less than 20 fathoms off the northwestern and southwestern sides of Christian Island.

Shore.—The western side of Christian Island has no very remarkable feature. As before remarked, Daly Point is low. A little south of Quai des Roches a bluff appears and at Hayter Point approaches to within 400 yards of the shore. The bluff here is very steep, about 300 feet high, and almost wholly obscured by trees. One-half mile south of Hayter Point the bluff drops over 100 feet, and the island maintains nearly a uniform height to Little Island, where a gradual descent begins, continuing nearly to Bar Point.

Indian village is situated $2\frac{3}{4}$ miles north by west from Bar Point Lighthouse. It contains Roman Catholic and Union churches and several houses. A wharf at which vessels drawing 10 feet could lie in 1893 is built here.

Between Bar Point and the village the coast falls back westward $1\frac{1}{2}$ miles from the direct line joining them. Deep water reaches to within 50 yards of the northern side of Bar Point, but very shallow water fronts the whole of the shore of the bay for over 440 yards until near the village, where it is only 100 yards wide. The shore is sandy with only a few boulders, and the shallow bank drops quite suddenly to deeper water.

Anchorage.—Between the shoal water and the 10-fathom curve is a shelf about 590 yards wide, on which vessels will find good holding ground, taking care to anchor far enough out to swing clear of the large stretch of shoal water, the best place being about 590 yards off the Indian village.

Menague Point is a large, high, rounding, well-wooded headland forming the easternmost part of Christian Island, and situated 3 miles northward from Bar Point Lighthouse.

Between the Indian village and Menague Point the shore trends eastward, and is fronted by shoal water for 250 yards. At Menague Point the bank falls steeply to 10 fathoms.

Mayne Point, somewhat resembling Menague Point, is situated $1\frac{1}{2}$ miles northward from it, the shore between being slightly indented and fronted by shallow water for an average of nearly 440 yards.

Charity Point, the northeastern extremity of the island, lies $1\frac{1}{2}$ miles northwestward from Mayne Point, and between them is an open bay fronted by shallow water for 590 yards, falling steeply to deep water. The 3-fathom curve approaches to within 200 yards of the northeastern and northern sides of Charity Point, but westward a very shallow bank extends 880 yards; the point is fringed with out-lying boulders.

Between Charity and Daly points is a large bay $1\frac{1}{2}$ miles deep from the line of the points. Very shallow water fringes the shore of this bay for an average of 200 yards; the 10-fathom curve is 880 yards from the eastern and southern shores and 590 yards from the

western side, thus affording anchorage space between the very shallow and deep water, but the shelter from the prevailing winds is not good.

Salt Cove, a small boat harbor, lies 880 yards southeast of Daly Point, and is the resort of a few fishermen.

A bank with greatest depth of 7 fathoms connects Christian and Hope islands, the channel between the 3-fathom curves on either side being 1,175 yards wide. While Hope and Christian islands are connected with each other and the mainland by bars, Beckwith Island has deep water on all sides.

Hope Island is the northern of three large islands lying 18 miles north of Collingwood, which are often called The Christian islands. Hope Island is densely wooded and easily distinguishable by its sharp, dark, tree-covered summit near the middle of the northern side. This summit, 290 feet high, which can be seen a great distance from the northwestward is only 100 yards from the northern coast to which it falls in a steep cliff bare of trees. The fall to the south coast is gradual for 1,320 yards, when it takes a sudden dip, conspicuous from the east.

Hope Island Light, fixed and group flashing white, 54 feet above water, visible 12 miles, is shown from a white, square wooden structure on the northeastern point of the island.

Fog signal.—The fog signal is made on a diaphone.

The diaphone has an abrupt ending in a lower note, but not so pronounced as that at Cove Island.

Dry stones extend 100 yards northward from the lighthouse. A small landing wharf for boats is built on the eastern side of the island, just southward of the lighthouse.

Hardhead Point is the northwestern point of Hope Island, situated $1\frac{1}{2}$ miles westward from the lighthouse, the shore between being indented by several slight wide-open bays, with bowlders for some distance from the shore.

Lottie Wolf Rock, with 9 feet of water on it, is the outer shoal spot on a large bank extending 1,320 yards from the whole of the northern side of Hope Island, and lies 1,320 yards northwest by north from Hope Island Lighthouse; only 18 feet will be found 300 yards northwestward from Lottie Wolf Rock. On the northeast side of the rock, however, 4 fathoms will be found at 50 yards.

Light buoy.—A red buoy showing an occulting red light is moored in 21 feet on the northwest side of this rock.

Clearing mark.—To pass northeast of this rock, keep Bayly and Motton points (Beckwith Island) in line, bearing 141° (SSE. $\frac{1}{4}$ E.). From Lottie Wolf Rock the 3-fathom curve gradually curves so as to pass only 200 yards from the lighthouse.

Dry bowlders encircle Hardhead Point for 200 yards, and a depth of less than 6 feet will be found 1,175 yards northward of the point. The 3-fathom curve 200 yards northwest of this shallow bank runs eastward 1 mile, whence it turns south, leaving a deeper gully just westward of Lottie Wolf Rock. A rock awash lies 590 yards northwestward from Hardhead Point, and its southwest side is steep-to; westward of Hardhead Point the 3-fathom curve approaches the coast to within 440 yards.

Hoar Point is situated 1,175 yards south-southwest from Hardhead Point, the coast between them being nearly straight and fringed with bowlders to 100 yards; the 3-fathom curve follows the coast and encircles Hoar Point at 200 yards.

South Point is nearly $1\frac{1}{4}$ miles southeastward from Hoar Point and between them the coast protrudes slightly outside the line of these points. A bank under the depth of 15 feet extends over 590 yards from South Point, and a pile of bowlders lies 200 yards from the coast just west of South Point.

Clearing mark.—To lead southward of all the shoal water from South and Shoal points (Hope Island), as well as north of the shallow water from Christian Island, keep Giant's Tomb Island Lighthouse in range with Motton Point (Beckwith Island) bearing 93° (E. $\frac{1}{4}$ S.).

Shoal Point is $1\frac{1}{4}$ miles southward from the lighthouse, and eastward over 1,175 yards from South Point, the bight between, 440 yards deep, being known as Sandy Bay.

Anchorage.—Near the middle of Sandy Bay, with Daly Point (Christian Island) just closed behind South Point bearing 254° (W. $\frac{1}{4}$ S.) will be found fairly good anchorage in $2\frac{1}{2}$ fathoms over sand. In strong winds from west-southwest through east to west-northwest, a swell rolls in that makes the anchorage uncomfortable. The 3-fathom curve follows the contour of the bay, passing 250 yards from Shoal Point.

A reef extends in all directions from Shoal Point, particularly toward the east, where a depth of 12 feet will be found close to the edge 1,320 yards from the point. East-southeast from the point 1,175 yards is a spot on the same bank with only 10 feet of water on it, gradually shoaling to the point.

Clearing mark.—To lead eastward of this reef, keep Bar Point Lighthouse (Christian Island) in range with Menague Point bearing 184° (S. by W.).

Between Shoal Point and the lighthouse the shore protrudes about 200 yards near the middle and is lined with bowlders. The 3-fathom curve after encircling Shoal Point Reef turns southwestward to within 590 yards from Shoal Point, trending thence northward to 200 yards eastward of the lighthouse.

Anchorage.—If for any reason a vessel wishes to anchor at Hope Island, she will find good anchorage from 440 to 880 yards from the coast between the lighthouse and Shoal Point, in 3 to 6 fathoms over sand and mud.

The 10-fathom curve lies about $1\frac{1}{2}$ miles from the north side of Hope Island, 1,175 yards from the east side and about 880 yards from the northwest and southwest sides.

Caution.—In thick weather or at night, when in the vicinity of Hope Island, do not shoal to less than 20 fathoms.

Beckwith Island is the second in size of the three large islands often called the Christian Islands. It is densely wooded, and is almost divided by two bays that are only separated by an isthmus 200 yards wide at one-third its length from the northern end. The northern bluff on the island is 210 feet high to the top of the trees, the southern and main part 317 feet.

Motton Point is a double point 300 yards wide situated 2 miles east-southeastward from Shoal Point of Hope Island.

From Motton Point the northwest coast of Beckwith Island trends first nearly straight southwestward 1,320 yards, then southeastward nearly 1 mile to the bottom of the western bay of the island.

Off Motton Point a shallow bank extends 300 yards, gradually diminishing in width to the west point, which is quite steep-to, but lined with large bowlders. In the bay on the west side shallow water makes out 300 yards.

Faith Point, the southwestern extremity of the island, is situated $1\frac{1}{2}$ miles east-northeastward from the nearest part of Menague Point (Christian Island) and over $1\frac{1}{2}$ miles southward from the bottom of the western bay. Large bowlders line this coast, and shallow water fringes it for an average of 200 yards.

Variation Point is situated 1.3 miles eastward from Faith Point, the fairly straight coast between extending nearly 440 yards outside the line of the points. Shoal water fringes the coast at an average distance of 200 yards.

Anchorage.—In a neighborhood where the water is so deep as about the Christian Islands, even limited anchorages are often a great convenience. One of these will be found 1,175 yards southwest from Variation Point.

Bayly Point lies northward $1\frac{1}{2}$ miles from Variation Point and 2 miles southeastward from Motton Point.

The coast between Faith and Variation Points is sandy and covered with small stones, that between Variation and Bayly Points being fringed with very shoal water for 150 yards, dropping suddenly to very deep water.

From Bayly Point the shore first trends nearly straight northwest over 1,320 yards to the entrance of the eastern bay. From Motton Point the coast trends nearly straight southward 1 mile to the bottom of the same bay, and is lined with large bowlders. One conspicuous large bowlder lies 50 yards northeast of Motton Point.

Shoal water extends nearly 590 yards from the bottom of the bay and 250 yards from the stony shore north of it.

Caution.—In thick weather or at night do not shoal to less than 20 fathoms around Beckwith Island, remembering that this depth on the western side will be found in places within 150 yards of it.

Methodist Point.—From Thunder Point, on the mainland, the shore trends north-northeastward $2\frac{1}{2}$ miles to the northeastern extremity of Methodist Point, forming a couple of very slight bays containing shoal water with outlying bowlders, the northeastern having shoal water extending nearly 880 yards from the beach. Methodist Point shows up conspicuously from the east and southwest, being more decided as a point and covered with dark trees. Shoal water extends 100 yards from the northwestern side and 200 yards from the northeastern extremity.

From the bottom of Thunder Bay to Methodist Point the shore 440 yards inland is backed by a high, steep bank, partly covered by trees and in some places cleared for farming.

Methodist Bay is a small cove southeastward of Methodist Point, where limited anchorage for small vessels and shelter from all but northerly winds may be had.

Stony Point, not at all prominent, lies 1.6 miles southward from and is the nearest land to Giant's Tomb Island Lighthouse. It is also $1\frac{1}{4}$ miles eastward from Methodist Point, the shore of the bight between being fringed with bowlders and shallow water for a distance of 300 yards.

Sawlog Point lies over $2\frac{1}{2}$ miles eastward from Stony Point, the almost straight shore between them being lined with bowlders and shoal water for an average of 200 yards. From Stony Point the high land begins to recede, and the rise from the shore becomes very gradual. Sawlog Point is not very prominent but is important on account of the reef which extends 590 yards in a northerly direction from it, where a depth of 11 feet will be found, the ground being rocky and lumpy in the same direction for another 200 yards.

Buoy.—A red spar buoy marks the northern end of this reef.

Clearing marks.—To lead northward of this reef, keep the south fall of Hope Island in range with Giant's Tomb Island Lighthouse, bearing 279° (WNW. $\frac{1}{2}$ W.) or Brebeuf and Beausoleil Islands range lights in range bearing 88° (E. $\frac{1}{2}$ S.).

Giant's Tomb Island, the old name of which is said to have been Minnicoganashene, no doubt derives its name from the appearance

to the highest part as seen from The Westerns, when usually the hill, appearing to rise suddenly from the water, resembles a huge tomb.

The Tomb itself lies rather southwest of the middle of the island, but about equidistant from each shore. To the top of the trees it is about 250 feet high and rather flat. The rest of the island is quite low but wooded, the northern part appearing to have less heavy timber and to be lower than the southern part.

The island has an extreme length of $3\frac{1}{2}$ miles in a north-northeasterly and south-southwesterly direction with a greatest width of $1\frac{1}{2}$ miles abreast of The Tomb. Shallow water fringes the northeastern point for more than 200 yards in a northerly direction and 590 yards northeastward.

From the northeastern point of Giant's Tomb Island the northwest shore trends in a general southwest direction $2\frac{1}{2}$ miles to Parker Point, the whole shore being fringed with large bowlders and shoal water, making landing impossible in the slightest surf.

The Gap divides a part of the northeastern end of the island, 590 yards in length from the main and southwest portion. The northwest entrance to the Gap can not be used on account of the numerous bowlders, but from the southeast it may be entered by very light-draft boats, and a nice, well-sheltered boat cove found on the northern side. Several fishermen's huts mark the spot. Outside the fringe of bowlders on the northwest side is a very shallow flat extending 200 yards on an average, when it drops off suddenly to deep water. There are no outlying shoals on this side of Giants Tomb Island.

From Parker Point the coast trends south-southwestward 1,175 yards and then south-southeastward $1\frac{1}{2}$ miles to the lighthouse.

Southwest Harbor is a small boat cove on the west coast used by fishermen only, whose huts show up conspicuously upon the shore. The entrance, 200 yards wide, is situated nearly 1 mile northward from the lighthouse. The cove is about 200 yards square and 6 feet of water may be carried in. A large marsh nearly connects Southwest Harbor with the east coast of the island.

The coast from Parker Point to the lighthouse is fringed with large bowlders for 50 yards, and the shallow bank outside them is only 100 yards wide.

Giants Tomb Light, fixed group flashing white, 40 feet above water, visible 13 miles, is shown from a white square wooden structure on the southern end of the island.

Fog signal.—A hand foghorn is sounded in reply to vessels' signals.

Vessels approaching the light from the northwest will find it obscured by trees when bearing southward of southeast. When approaching from the east the light will be totally obscured if bear-

ing westward of 268° (W. $\frac{1}{2}$ N.). Partial obscuration only by some smaller trees occurs when the lighthouse bears a little northward of the latter bearing.

A spit with 9 feet of water near the outer edge extends 590 yards southwestward from Giants Tomb Island Lighthouse.

Bennett Bank has two shoal spots, one with 8 feet of water on it near the western edge, and the other with 9 feet near its northern edge. The bank is connected to the island by a flat having less than 3 fathoms of water. The shoalest spot is nearly 1,175 yards west from the lighthouse, and the bank projects southwest from it 200 yards to the depth of 15 feet.

A rock, with 15 feet of water upon it, lies 150 yards southwest from Bennett Bank.

Light buoy.—A black cylindrical buoy, showing an occulting white light, is moored on the south side of the 15-foot patch, 1,175 yards 246° (WSW. $\frac{1}{2}$ W.) from Giants Island Tomb Lighthouse.

Clearing mark.—To pass south of this rock, Bennett Bank and the shoal water from Giants Tomb Island, keep the range lights at Brebeuf Island in line, bearing 88° (E. $\frac{1}{2}$ S.).

Caution.—In thick weather or at night, when approaching Giants Tomb Island from the northwest, a vessel should not shoal to less than 20 fathoms until certain of her position.

Raft Point, on the eastern side of the island, is situated $1\frac{1}{2}$ miles from the lighthouse. The lighthouse point trends 200 yards eastward, then gradually sweeps around in a gentle curve, forming a wide open bay 300 yards deep between it and Raft Point. The shore of the bay is fronted with a very shallow sand flat 250 yards broad with less than 6 feet, dropping suddenly to deep water, the 10-fathom curve in one place being only 50 yards outside the 1-fathom curve. Southeast of the lighthouse point the water is deeper, 2 fathoms being found 50 yards from the shore.

The shore from Raft Point to the Gap is a series of wide open bays and small points, all fringed by such shallow water over sand for an average of 300 yards that landing is difficult.

Anchorage.—The best anchorage eastward of Giants Tomb Island is between Raft Point and the Gap in a depth of 7 to 10 fathoms, 880 yards from the island.

Sawlog Bay is the indentation 590 yards deep between Sawlog and Adams points, and contains fairly good anchorage in about 7 fathoms, mud bottom.

Adams Point is a long portion of shore, the part most deserving the name "point" being situated $1\frac{1}{2}$ miles east-southeast from Sawlog Point. From the shore between Sawlog Bay and this point shoal water with rocky bottom extends 590 yards to a depth of 18 feet, with 13 feet of water 50 yards inside it.

Clearing mark.—To lead northward of this spit, keep the summit of Hope Island open north of Giants Tomb Island Lighthouse bearing 284° (W. by N. $\frac{1}{4}$ N.).

From Adams Point the shore gradually turns southward for $1\frac{1}{2}$ miles to Pinery Point.

Pinery Point.—This point, while not prominent as such, is well marked by a bare sand bank about 40 feet high extending 200 yards along the shore, the Indian expression for which gives the name of Penetanguishene. A sand flat having barely a foot of water over it, but very steep-to, has a width of 350 yards at Adams Point, and keeps nearly the same width till abreast of Pinery Point, when it widens to over 590 yards.

Northwest (Michaud) Point of the entrance is 1,320 yards southwest by west from Sloane Point and the bight between them (sometimes called Black Bay) contains good anchorage in 4 to 8 fathoms over mud, its shore being fringed by a shallow bank 100 yards wide. Through the bar formerly connecting Northwest Point to the Reformatory shore, a channel 100 yards wide and 19 feet deep at low stages of the water, has been dredged and buoyed.

Reformatory Asylum Point, extending northwestward from the mainland, forms the eastern point of the harbor entrance. A shore bank extends about 100 yards northwestward from the extremity of the point.

Reformatory Point Pier.—A pier extends 100 yards north-northwest from Reformatory Point, and at the outer end there was a depth of 14 feet in 1914.

Light.—A fixed white light, 17 feet above water, visible 8 miles, is shown from a white, square, wooden structure located on the outer end of Reformatory Point Pier.

This light in range astern with Whisky Island Light bearing 49° (NE. by E.) leads, with 19 feet of water at low stages, through the dredged channel between Northwest Point and the Reformatory shore.

Northwest Basin, nearly 1,175 yards westward from Northwest Point, is shallow, the 3-fathom curve reaching only as far as its south point.

Waitabit Point.—From Northwest Basin the west shore trends southward nearly straight $1\frac{1}{2}$ miles to Waitabit Point, and is clean, excepting the point itself, whence a very shallow spit extends off 100 yards.

Buoy.—This spit is marked by a red spar buoy.

Shehan Point is on the east shore of the harbor, 590 yards southward from Magazine Island, and may be approached to 100 yards.

Magazine Island, 9 feet high, is the only island in the harbor, and upon it still stand the remains of the old naval and military

magazine. The island, 200 yards long north and south by 70 yards in width and wooded, is 300 yards from the east shore and over 1,175 yards south-southwest from the Reformatory pier. The water is good on its east and west sides, but from its north end a spit extends off 80 yards to 5 feet, and 150 yards to 15 feet of water. From the southern end of the island a spit with 2 feet water extends 200 yards southward, almost joining a similar spit making out 250 yards from the east shore of the harbor, leaving a passage for craft of light draft. A pier belonging to the asylum is erected on the shore east of Magazine Island.

Buoy.—A black spar buoy marks the shoal water on the western side of Magazine Island.

Clearing mark.—South Basin range lights, although established primarily to lead through the dredged channel abreast the town, lead incidentally close westward of the above buoy.

The eastern shore of Penetanguishene Harbor is low for some distance from the water, and then rises abruptly, attaining in some places a height of over 200 feet; the top of the ridge is generally bare, flat and sandy except at the asylum, where boulders displace much of the sand, and the slope is very gradual.

Davidson's Wharf.—The western shore of the harbor rises to a height of about 170 feet in 200 to 400 yards from the shore, until abreast of Davidson's wharf, when the high land recedes; the slope is partially wooded, and close to the water between Northwest Basin and the wharf is an almost continuous string of Indian and Half-breed huts. The wharf situated on the west side of the harbor, over 1,320 yards southward of Waitabit Point has depth sufficient for small craft.

Range lights—Front.—A fixed red light, 100 feet above water, is shown from a mast, about 535 yards 117° (SE by E) from the mouth of Copeland Creek.

Rear.—A fixed red light, 143 feet above water, is shown from a mast 185 yards 186° (S by W $\frac{1}{2}$ W) from the front light.

These in range bearing 186° (S by W $\frac{1}{2}$ W) lead into dredged channel abreast the town.

Esplanade Light.—A red over a white lantern light is shown on the northwest corner of the Esplanade wharf.

Buoy.—A red spar buoy marks the outer end of the sand bank at Pinery Point.

Hallen Rock, with 14 feet of water on it (in low stages there may be 2 feet less) lies 1,175 yards southeast by south from the highest part of Pinery Point, and vessels will pass southeastward of it by keeping Lafontaine Hill (not conspicuous in hazy weather) over the Reformatory (Asylum) bearing 224° (SW. $\frac{1}{2}$ W.).

Sloane Point is situated $1\frac{1}{2}$ miles southwestward from Pinery Point, and the shallow sand bank that skirts the whole shore from Adams Point is here only 70 yards wide, while between Pinery and Sloane Points it averages 270 yards.

Whisky Island, 4 feet high, 40 yards long north and south by 15 yards wide, is situated 440 yards eastward from Sloane Point. Very shoal water extends 225 yards from its southern point and from all other sides 100 yards.

Clearing mark.—To pass between Whisky Island and Sloane Point, the mark in 1892 was to keep the northernmost of the Indian huts on the western shore of the harbor in range with the lighthouse on Reformatory Point Pier, bearing 223° (SW. $\frac{1}{2}$ W.). This mark also led southeast from the sand spit off Pinery Point.

Whisky Island Light, fixed white, 33 feet above water, is shown from a white, square, wooden structure on the island at the entrance to Penetanguishene Harbor.

Penetanguishene Harbor is an excellently sheltered indentation $3\frac{1}{2}$ miles long from the entrance between Northwest and Reformatory (Asylum) Points to the bottom of the slightly broader expanse named South Basin. The breadth of the entrance is nearly 590 yards and that of the remainder averages from 590 to 1,175 yards.

A conspicuous landmark in approaching the harbor is the Reformatory (provincial asylum or hospital for the insane), situated on the high land eastward of the entrance. In the early part of last century the site was an important naval and military station.

A large portion of the harbor has natural depths varying from 20 to 30 feet, but at the entrance, and again abreast the town, channels have been dredged, through the latter of which 18 feet (at 579 feet above mean tide at New York) can be carried to the Esplanade or town wharf.

Buoys.—Marking the edges of the dredged channel opposite the town, are placed four red and one black spar buoys.

Tannery Point—Buoys.—Off this point, on which stands a tannery, situated 440 yards south of the summer hotel, is moored a black spar buoy, with a second and similar buoy southeast of it leading to the wharf, at which the depth is about 12 feet.

Directions.—From Cabot Head the course and distance to the edge of the 20-fathom bank $1\frac{1}{2}$ miles north of Hope Island Lighthouse and northeast by north 1,320 yards from Lottie Wolf Rock Light Buoy is 111° (SE. by E. $\frac{1}{2}$ E.), 60 miles, passing $2\frac{1}{2}$ miles southwestward of Western Islands.

From Owen Sound the course from Vails Point Light Buoy to a position $1\frac{1}{2}$ miles north of the same light is 66° (E. by N. $\frac{5}{8}$ N.) and distance $32\frac{1}{2}$ miles. As this course leads less than 590 yards north-

westward of Hope Island Bank, a vessel should not stand into less than 20 fathoms in the vicinity of The Christians in thick weather or at night.

From this position north of Hope Island Lighthouse the course to Bennet Bank Light Buoy is 119° (SE. $\frac{1}{4}$ E.) and distance $8\frac{1}{4}$ miles. When 200 yards southward from this buoy, the Brebeuf Range Lights (Beausoleil Island) will be in range and should be steered for, bearing 88° (E. $\frac{1}{2}$ S.) for 3 miles, when a vessel will be 150 yards northward of Sawlog Point Reef Buoy.

Gin Island may now be steered for 108° (SE. by E. $\frac{1}{4}$ E.) for a couple of miles, when the Elimere Range Lights should be brought in line ahead, bearing 152° (S. by E. $\frac{1}{8}$ E.). Having run $2\frac{1}{4}$ miles on this range, a vessel should alter course southward, steering 223° (SW. $\frac{1}{4}$ W.) with Lafontaine Hill in range with the Provincial Reformatory (Asylum) to lead southeast of Hallen Rock.

When Whisky Island Light is abaft the starboard beam, a vessel may pass close northwest of Reformatory (Asylum) Point Pier Light, and pass through the dredged channel by keeping Whisky Island and the latter in range astern bearing 50° (NE. by E.), assisted by the three buoys.

South Basin range lights (near the town) should now be steered for in range bearing 185° (S. by W. $\frac{1}{8}$ W.) and when the wharf lights bears 148° (SSE. $\frac{1}{4}$ E.), a berth may be taken up at the esplanade (town) wharf.

Those well acquainted, passed in 1892, northwest of Hallen Rock and Whisky Island by keeping the northernmost of the Indian huts on the western shore of the harbor in range with Reformatory (Asylum) Pier Light bearing 223° (SW. $\frac{1}{4}$ W.).

From Collingwood the course from Lockerbie Rock Light Buoy to the buoy marking Campana Shoal south of Bar Point, Christian Island, is 14° (N. by E. $\frac{1}{8}$ E.) $16\frac{1}{4}$ miles. The bar may be crossed at low stages of water by vessels drawing not over 14 feet, by keeping Variation Point (the right tangent of Beckwith Island) in range with Cedar Point (the left tangent of the nearer mainland) bearing 26° (NE. by N.):

When Bar Point Lighthouse bears southward of 263° (W.) the bar will be crossed, and a vessel may haul northward, passing $\frac{1}{2}$ mile northwest and northward of Cedar Point, and thence steer 51° (NE. by E. $\frac{1}{4}$ E.) for Bennet Bank light buoy (Giant's Tomb Island) $6\frac{1}{4}$ miles, whence proceed as before directed.

The town, with a population in 1911 of 3,568, is pleasantly situated on rising ground on the eastern side of the southern part of the harbor. It is a Grand Trunk Railroad Station, as is also the town of Midland situated a little over 2 miles distant, although, at

present, there is no direct railway connection between them. Daily steamship communication is had with Parry Sound Town, and frequent connection with the principal Georgian Bay and North Channel ports by the vessels of three other companies.

The town has a good water supply, and all stores necessary for a vessel can be obtained; it contains good hotels, banks, telegraph and telephone offices, a hospital, Carnegie library, and Canadian Express Co. Firstbrooks Box Factory is situated at the bottom of South Basin, and a depth of 13 feet at low stages can be carried to the wharves.

Northward of the esplanade are Beck's saw mills and wharves, to which a narrow channel with depth of 17 feet has been dredged. The most conspicuous building in the town is the Roman Catholic church with its two towers.

Customs.—Penetanguishene is a port of entry.

Sucker Creek Point, which, with Pinery Point may be said to form the outer points of approach to Penetanguishene Harbor, takes its name from a small creek entering the bay near this large rounding undefined point; it is situated $2\frac{1}{4}$ miles eastward from the entrance to the harbor, and between the shore forms a large open bay with deep water within 50 yards of the land. A quarter of a mile southeast of Reformatory Pier Lighthouse there is a small coal wharf.

Matchedash Bay.—Between Sucker Creek Point and Beausoleil Island, is the entrance to what was formerly, and, in this book is still called Matchedash Bay, although, locally, the name is only applied to a small shallow bay used by boats and very small tugs, situated eastward of Waubaushene Village.

Midland Point forms the northwestern entrance point of Midland (Gloucester) Bay and is situated 2.3 miles south-southeast from Sucker Creek Point, the shore between forming a gradually rounding headland backed by high and thickly wooded land; excepting a flat extending 200 yards from Sucker Creek, the shore is bold to within 75 yards.

Range lights—Front.—A fixed white light, 49 feet above water, is shown from a white, square, wooden structure, about 880 yards north of the point.

Rear.—A fixed white light, 85 feet above water, is shown from a white, square, wooden structure, 135 yards 283° (WNW. $\frac{1}{4}$ W.) from the front light.

These in range lead up from the intersection of their alignment with that of the McNicoll range to the intersection of their alignment with that of the Victoria Harbor range.

On account of the timber, the rear lighthouse is not seen until nearly in line with the front one.

Snake Island, about 10 feet high and well wooded, is made up of two parts, the northern being the larger and more important; the combined island lies $1\frac{1}{2}$ miles northeastward from Midland Point, and 1 mile from the nearest part of that shore. The island is nearly 590 yards long north and south and 75 yards wide, a bank under 16 feet extending 150 yards northward; and depths under 5 feet, 100 yards southward from the southern islet.

Buoy.—A black spar buoy in 4 fathoms marks the latter.

From Midland Point the shore trends west-southwest $1\frac{1}{2}$ miles to the bottom of a bay, thence 880 yards southward to the outer end of the long wharf and conspicuous iron ore smelter, the shore being fringed with shallow water for an average of 75 yards.

Midland Bay Shoal, with 11 feet water on it, lies 1.1 miles south-westward from Midland Point and almost directly in the track of vessels bound to Midland. A rock with 17 feet water on it lies 350 yards westward from Midland Bay Shoal.

Buoy.—A red spar buoy marks Midland Bay Shoal.

Clearing mark.—To pass eastward of this shoal keep the eastern end of Present Island in range with Midland Point, bearing 25° (NNE. $\frac{1}{2}$ E.).

The shore from Midland wharves to Dollarville, now incorporated with Midland, consists of a gradually rounding point on which are prominently situated the two sawmills of Fairbairn and that of Manly Chew.

Tiffin is a basin at the mouth of Wye River and owned by the Grand Trunk Railroad Co.; it is situated $1\frac{1}{2}$ miles eastward from Midland Harbor and is a suburb of the town of Midland. This basin, about 500 feet wide and 880 yards long in a northwesterly direction, has a depth of 24 feet (579 feet above mean tide at New York). Two large and conspicuous elevators, the Aberdeen and Grand Trunk Pacific, showing fixed white lantern lights, stand near the southwest wall of Tiffin Basin.

There are new and modern terminal facilities at Tiffin.

Range lights—Front.—A fixed red light, 31 feet above water, is shown from a mast on the northwestern end of the dock at Tiffin.

Rear.—A fixed red light, 53 feet above water, is shown from a lantern attached to the northwest wall of the Grand Trunk Railroad Elevator.

These in range bearing 142° (SSE. $\frac{1}{2}$ E.) lead to the dock in front of the Grand Trunk Railroad Elevator.

Midland Harbor, excellent and well protected, is situated in the southwestern corner of Midland Bay, southeastern part of Georgian Bay, and has a depth of 25 feet. There are a number of mills, smelting works, dry dock, coal docks, and grain elevators.

A wharf with ample water fronts the smelting and engine works on the west side of the bay. Boats drawing 20 feet of water can lie at the coal docks, which are well sheltered from storms. Dredging to a depth of $20\frac{1}{2}$ feet was done in 1917 along the launching face of the Midland Dry Dock and extending out to deep water. King Street is the dividing line of the Grand Trunk and town landing wharves, the former with about 15 feet and the latter with about 9 feet of water. At the elevator wharf there is sufficient depth for the largest grain carriers, and in the small harbor behind the elevator small vessels and tugs may lie in a limited space. Vessels are well sheltered at the wharves. No storm interferes with the handling of cargo. Many large steamers are put in winter quarters here. One of the most conspicuous erections is the Canadian Corporation Co.'s iron ore smelter built on the northwest side of the bottom of the bay.

Range lights—Front.—A fixed red light, 150 feet above water, visible 4 miles, is shown from a mast on the hillside in the southwestern part of the town.

Rear.—A fixed red light, 190 feet above water, visible 4 miles, is shown from a mast located 440 yards 230° (SW. by W. $\frac{1}{2}$ W.) from the front light.

These in range bearing 230° (SW. by W. $\frac{1}{2}$ W.) lead in from the intersection of their alignment with that of the McNicoll range to the wharves in the harbor, clear to southeastward of Midland Bay Shoal.

Grain elevators.—There are four large grain elevators, with 1,000,000 to 2,500,000 bushels capacity, each of which has facilities for handling 10,000 bushels per hour.

Directions.—Follow the directions given for Penetanguishene as long as applicable, continuing on the Elimere (McNicoll) Point Range, later described, until the two range lights close together near Midland Point are abeam, when haul gradually southward at 880 yards from Midland Point until the Midland town range lights are in range bearing 230° (SW. by W. $\frac{1}{2}$ W.). These steered for at night, assisted in daylight by the eastern extremity of Present Island, in range with Midland Point, bearing 25° (NNE. $\frac{1}{2}$ E.), will lead southeastward of Midland Bay Shoal, when a berth may be taken up at the town wharves as requisite. If for Tiffin, the Elimere Point Range may be left when the two lights close together near Midland Point are abeam and the Aberdeen elevator, bearing 191° (S. by W. $\frac{1}{2}$ W.), steered for, to the line of the basin range lights.

Midland, with a population of 4,663 in 1911, is a terminal of the Grand Trunk Railroad, and is situated on the southwestern side of the bay of the same name. It possesses saw, shingle, flour, woolen, and planing mills, a large grain elevator in addition to the two at

Tiffin. It has also churches of most denominations, public schools, a library, and three chartered banks. It has daily steamship communication with Parry Sound town and Penetanguishene by a steamer of the Canada Steamship Co. and occasional connection by boats of three other companies with the principal ports of Georgian Bay and North Channel of Lake Huron.

Large quantities of grain are received here from the upper Lake Superior ports and Chicago by water and reshipped by rail eastward.

Railroad.—The Grand Trunk Railroad connects Midland with Montreal.

Trade.—During the year ending July 31, 1916, 30,000,000 bushels of grain passed through this port.

Coal and supplies can be purchased at reasonable prices, the Midland Coal Dock Co. having a large stock of coal with an expeditious system of loading, and vessels of heavy draft will find 19 feet of water at low stages alongside its wharf.

A wharf with ample water fronts the above smelter and the engine works 440 yards southwest of it.

West of the elevator are situated Chew's extensive sawmill and the box factory of Benson & Bray. A prominent object upon the sky line is the water tower.

Radio.—Of the four radio stations established on the shores included in this volume Midland has one. The two high masts are situated on the high land and southwestward of Tiffin Basin, and the call is V. B. C.

Storm signals are displayed at Midland.

Customs.—Midland is a port of entry.

Elimere Point, on the southeastern side of Midland Bay, is 1 mile northeastward of Tiffin Basin, the bight between having a shallow bank extending out 440 yards, although the point itself is steep-to.

Range lights—Front.—A fixed white light, 28 feet above water, visible 10 miles, is shown from a white, square, wooden structure near the shore eastward of Elimere Point.

Rear.—A fixed white light, 166 feet above water, visible 12 miles, is shown from a red, square, skeleton tower, 860 yards 152° (S. by E. $\frac{1}{4}$ E.) from the front light.

They, in range, lead from the intersection of their alignment with that of the Brebeuf Range to the intersection of their alignment with that of the Midland Range.

The shore from Elimere Point to Flat Point trends nearly straight, east by north $1\frac{1}{2}$ miles, and is fringed by shallow water for an average of 250 yards for the western half and for 440 yards as Flat Point is approached.

Flat Point, separating Midland and Hog Bays, is a long low flat point bare of trees for some distance from the water's edge, and in addition to the dry part has a submerged rocky flat extending north 300 yards.

Buoy.—A red spar buoy marks the outer end of this flat.

Hog Bay.—The western shore of this bay trends from Flat Point 3 miles southward, the mouth between Flat and Sturgeon points being $2\frac{1}{2}$ miles wide, the bay being nearly V shaped and shallow.

Crescent Island, 200 yards long, 50 yards wide, and wooded, is situated 1,175 yards southward from Flat Point. East by north 590 yards from Crescent Island the depth is only 11 feet, and east-southeast the same distance from the island lies a rock with less than 6 feet, being the most outlying spots on the extensive shallow flat stretching from Flat Point to the dredged approach to port McNicoll.

The land between Midland and Hog bays attains a height of about 200 feet and is well wooded. In 1893 a conspicuous clump of trees was situated $1\frac{1}{2}$ miles southwestward from Flat Point, and in the vicinity of the present back tower of the Elimere Point Light Range.

Port McNicoll, situated on the west side of Hog Bay, $2\frac{3}{4}$ miles east of Midland, is the Georgian Bay port of the Canadian Pacific Railroad steamers running to Port Arthur and Fort William in Lake Superior. This artificial basin, 880 yards long in a northeasterly direction and 200 yards wide, has a depth of 24 feet (at 579 feet above mean tide, New York). A large elevator is erected here for reception of the large quantity of grain received by ship from Duluth, Fort William, and Port Arthur.

Storm signals are exhibited at Port McNicoll.

Light buoy.—A red cylindrical buoy, showing an occulting red light, is moored on the northwestern side of the channel leading to the Canadian Pacific Railroad Dock.

The southeastern side of the channel is marked by 3 black spar buoys.

Berthing space is provided for about 11 vessels.

Pier.—The latest works is a pier 1,000 yards long and 650 feet wide.

Trade.—During the year 1915-16, 34,300,000 bushels of grain passed through this port.

Railroad.—The Canadian Pacific Railroad connects Port McNicoll with Montreal.

Buoy.—A wooden spar buoy, painted black and white vertical stripes, is moored as a fairway buoy to mark the point at which vessels leave the alignment of the Midland Point range lights and turn onto the alignment of the Victoria Harbor range lights.

Victoria Harbor.—On the eastern shore of Hog Bay, a little more than halfway from the bottom to Bergie Point, is situated the southern extremity of a shallow bight 1 mile wide and $\frac{1}{2}$ mile deep, in the northeast corner of which is located the village of Victoria Harbor, having a population of about 2,000. The village possesses three sawmills, lumber being its principal industry. It is a station of the Grand Trunk Railroad and possesses telegraph and post offices. The shallow bight above mentioned is almost filled with loading piers and booms for holding logs.

Wharves.—A coal wharf, belonging to the Victoria Harbor Lumber Co., with a depth at its outer end of 19 feet (at 579 feet above mean tide at New York), projects 330 yards in a southwesterly direction from the southern part of Bergie Point, leaving a clear space between it and Port McNicoll of a little over 587 yards. The Government wharf has the same depth. A light is shown from the outer end of the coal wharf when one of the coal company's vessels is expected.

Bergie Point, sheltering Victoria Harbor from northerly winds, is situated $1\frac{1}{2}$ miles southeastward of Flat Point, and 2 miles from the bottom of Hog Bay; it is low, flat, covered with bowlders and trees, with shallow water extending westward from it 75 yards.

Range lights—Front.—A fixed red light, 27 feet above the water, visible 7 miles, is shown from a white, square, wooden structure, located on Bergie Point.

Rear.—A fixed red light, 100 feet above the water, visible 7 miles, is shown from a similar structure located on a hill behind the village 1,400 yards 149° (SSE. $\frac{1}{2}$ E.) from the front light.

These in range bearing 149° (SSE. $\frac{1}{2}$ E.) lead into the harbor from the intersection of their alignment with that of the Midland Point Range to the dredged channel leading to the Canadian Pacific Railroad dock on the western side of the harbor.

Directions for Port McNicoll.—Follow the directions given for Midland, but continue on the Elimere Point Range until 880 yards south-southwestward from Snake Island black spar buoy, whence haul eastward with Midland Point range lights in range astern, bearing 283° (W. by N. $\frac{3}{4}$ N.). When 880 yards northeastward of Flat Point Victoria Harbor range lights will be seen in range ahead, bearing 149° (SSE. $\frac{1}{2}$ E.), with Port McNicoll lightbuoy a little on the starboard bow; if the back light tower is hard to make out, a solitary elm tree upon the sky line is of great help (1914). Pass 150 yards east of this buoy and steer through the dredged channel to Port McNicoll Harbor, passing northwestward of the three black spar buoys.

Methodist Island, lying midway between Flat and Sturgeon Points, is 880 yards long north and south by 200 yards in greatest width; a large cluster of bowlders lies 300 yards from its western side, which, however, has good water at 50 yards. No important spit makes out from its northern point, but not more than 15 feet will be found 300 yards north of the island; the southern extremity may be approached to 100 yards. Eastward 300 yards from the sandy point on the east side of the island is a dangerous reef with only 1 foot on it.

Gore Rock, with only 4 feet water over it, lies nearly 880 yards northeastward from the northern point of Methodist Island, and is a very dangerous obstruction to the navigation of the passage northward of the island. It lies near the northern edge of a large bank with less than 3 fathoms, having, however, no other such very dangerous spots.

Buoy.—A red spar buoy is moored on the northern side of Gore Rock.

Sturgeon Point marks the southeastern limit of navigation of Matchedash Bay for any but shallow draft vessels; the two horns of the point are 590 yards apart, and between them is a small bay. From Bergie Point the shore trends eastward 590 yards, thence straight northeast 1.1 miles to the western horn of Sturgeon Point; this shore has no dangerous rocks off it, but not more than 17 feet can be carried between it and Methodist Island.

Sturgeon Bay, a broad V-shaped bay lying between Sturgeon Point and Waubaushene, is $2\frac{1}{2}$ miles wide between those places, with about the same length, the shores being fringed with shoal water and marsh, the bank under a depth of 6 feet extending 880 yards from the bottom of the bay. The greatest depth in Sturgeon Bay is 15 feet, while a very small area is as deep as 12 feet, but all the bottom is mud excepting Middle Ground.

Middle Ground is a very shallow bank in two parts, the total diameter of which is 1,320 yards, lying in the western half of the mouth of Sturgeon Bay, with, as before stated, a buoyed channel north and south of it leading toward Waubaushene and Port Severn. The shallower channel south of Middle Ground is indicated by five red and four black spar buoys.

Sturgeon River is a very small stream emptying into the bottom of Sturgeon Bay, and only 2 feet water can be carried over its bar (at low stages it may be dry). On the southeastern shore of the bay, 300 yards, and 590 yards, respectively, northeastward from the mouth of the river, are situated a shingle and a saw mill, the piers of which can only be approached by vessels of very light draft, the products of these mills being mostly shipped by rail.

Turning Rock is 350 yards westward from Canary Island and nearly $1\frac{1}{2}$ miles east of Sturgeon Point.

Light.—An occulting white light, 30 feet above water, visible 6 miles, is shown from a white pyramidal steel tower, with a slatted day mark attached, on Turning Rock Waubauskene approach.

Waubauskene village is built upon the south entrance point of what is locally known as Matchedash Bay and is situated $2\frac{1}{4}$ miles east-southeast from Sturgeon Point. It is a station of the Grand Trunk Railroad, and lumbering is its chief industry. Its population is about 1,300.

Severn River Range Lights—Front.—A fixed red light, 18 feet above water, visible 2 miles, is shown from a mast on the eastern shore of Sturgeon Bay about 590 yards westward of Waubauskene village.

Rear.—A fixed red light, 26 feet above water, visible 2 miles, is shown from a mast 133 yards 168° (S. $\frac{1}{4}$ E.) from the front light.

These in range lead southward to the intersection of their alignment with that of the Waubauskene range lights.

Buoys—Beacons.—In addition to the above range from the intersection of its alignment with Waubauskene range the channel to Port Severn is marked by nine red and three black spar buoys and the following wooden day beacons:

Mary Rock, a white beacon with black top, to be left on the port hand entering.

Murray Island, a white beacon with red top, to be left on the star-board hand while entering.

Picnic Rock, white beacon with black top, to be left to port entering.

Tug Channel Rock, a white beacon with red top, to be left on star-board hand entering.

This channel was dredged to a least depth of 9 feet in 1916.

The Grand Trunk Railroad, after passing through Dollarville, skirts the bottom of Midland Bay near Tiffin, crosses Wye River 1,320 yards southeast of the latter, and passes close to the bottom of Hog Bay, turning northeastward to pass through Victoria Harbor village, and far enough north to avoid the high land between Hog and Sturgeon Bays. It then follows closely both shores of Sturgeon Bay and passes through Waubauskene.

Long Point is the low and partly wooded northern entrance point of Matchedash Bay, the latter being $3\frac{1}{4}$ miles long southeast and $1\frac{1}{4}$ miles broad. The nearest part of Long Point is a little over 440 yards northwest of the outer and northern end of Waubauskene Wharf.

Waubauskene Range Lights—Front.—A fixed red light, 18 feet above water, visible 2 miles, is shown from a mast on the flat north of the channel.

Rear.—A fixed red light, 24 feet above water, visible 2 miles, is shown from a mast, 167 yards 89° (E. $\frac{1}{4}$ S.) from the front light.

These in range lead up from the intersection of their alignment with that of the Severn Range to the Waubauskene wharves.

Buoys.—In addition to the above range, 11 red and 7 black spar buoys mark the dredged channel to Waubauskene, the western red buoy being moored 1,320 yards westward from Waubauskene Wharf.

Fesserton village is situated on the southwestern shore of Matchedash Bay (as locally known) and a couple of miles southeastward from Waubauskene, both the Grand Trunk and Canadian Pacific Railroads passing through it. A channel 100 feet wide with a depth of about 11 feet (with the surface 579 feet above mean tide at New York) is dredged from Waubauskene to Carter's wharf, excepting at a place about 1,320 yards from Waubauskene where there is a rocky ledge with 6 feet water on it. This channel is marked by five red and three black spar buoys.

Port Severn village, nearly 3 miles northward from Waubauskene, is built upon both sides of the mouth of the Severn River. The nearest telegraph office and railway station are in Waubauskene; the mail is daily.

A fine reinforced-concrete dam and bridge forming the western terminus of the Trent Canal system has been constructed by the department of railroads and canals across the mouth of the Severn River.

Directions.—Bound to Waubauskene or Port Severn in a vessel of light draft, follow the directions for Port McNicoll and Victoria Harbor until 880 yards southward of Candlemas Shoal Buoy (Beausoleil Island), when haul eastward from the Elimere Point Range, and steer 116° (SE. by E.) for 6 miles, passing 200 yards northward from Gore Rock red spar buoy to abreast of Sturgeon Point, eastward of which the master of a vessel should not proceed without local knowledge.

Vessels of heavier draft bound to Port McNicoll or Victoria Harbor can also pass between Snake and Present Islands by leaving the Elimere Point Range when 440 yards south of Candlemas Shoal Buoy. Then steer 125° (SE. $\frac{1}{4}$ E.) with the north point of Methodist Island ahead and Pinery Point sand cliff astern, for 4 miles, until the Victoria Harbor range lights are in range, whence proceed as before directed.

Currents.—Masters of vessels navigating Georgian Bay between Moose Point and Bar Point Lighthouse are cautioned against relying too rigidly upon their courses and distances, as during the sounding of the deep water north of Hope Island, round the Westerns, and westward of Christian Island strong currents were sometimes felt even in calm weather.

Green Island is the largest of a number of islands lying near the mouth of Severn River. The northwestern of the continuous reefs

extending 1 mile west-northwest from Green Island, lies also $3\frac{1}{2}$ miles southwestward from Present Island. From this extremity, the group including Canary Island is $2\frac{1}{4}$ miles long southeast by east, and 1,175 yards in greatest width. Between the above group and Sturgeon Point there is no passage for any but vessels of light draft, and for the use of the latter a channel on either side of Middle Ground is buoyed, the very narrow crooked channel north of it having a depth of about 12 feet and that south of Middle Ground a depth of about 8 feet (with the surface 579 feet above mean tide at New York).

Moore Point, the southeast entrance point of a large bay full of dry and sunken rocks, is a portion of the mainland, and on account of its dark color is very prominent. The northern half of a line joining Moore and Flat Points marks the northwest edge of a large area of foul ground, and no vessel should proceed southeast of this line unless within 1 mile of Flat Point.

Present Island, having erected upon it a large summer house (1893), rendering the island unmistakable, is situated 1.1 miles southeastward of southern end of Beausoleil Island. It has a maximum length of 1,175 yards in a west by north direction, is very irregular in shape, and its greatest breadth is 300 yards. The western part of the island is wooded, while the southeastern extreme is low and almost bare.

A sand flat extends westward 880 yards from the island where will be found a depth of 18 feet; only 6 feet, however, will be found at half that distance. From the southern side of the island a shoal flat makes out 200 yards, and from the northwestern side 100 yards. A rock with only 1 foot water over it lies on the bank 590 yards southeastward from the eastern extremity of Present Island. A series of shallow banks and rocks runs almost continuously in a straight line $2\frac{1}{4}$ miles east by south from Present Island to Moore Point, making navigation in the vicinity extremely hazardous.

Quarry Island is a large, well-wooded island lying $2\frac{3}{4}$ miles eastward from the south point of Beausoleil Island. Although it can not be reached by vessels of large draft, it is conspicuous on account of its distance from the shore, and its very dark appearance. The island, nearly elliptical in shape is 1,320 yards long in a northwest direction and 880 yards in greatest breadth.

The whole ground between Quarry and Present Islands is filled with a few dry granite rocks, and very shoal water. A channel of perhaps 14 feet might be buoyed were it necessary.

Honey Harbor.—Although not on the chart, Honey Harbor is a place much frequented by fishing parties and tourists. The channel to it, marked by one spar buoy with black and red bands, 6 black and 5 red spar buoys, passes southeastward of Roberts Island.

Roberts Island, 1.6 miles long northeast and southwest by 1,175 yards in average width, is situated with its south end 2 miles northeastward from the south end of Beausoleil Island. The island is only thinly wooded, and as it is somewhat removed from the ship's track, only this passing notice will be taken of it; the ground between it and Present Island is all foul.

Beacon.—On the southeastern extremity of Roberts Island is erected a triangular wooden framework day beacon with its three sides covered with slats and painted white.

Beausoleil (Prince William Henry) Island is $5\frac{1}{4}$ miles long in a north by east direction with a maximum width of $1\frac{1}{4}$ miles. The northern half is so masked by other islands and rocks, and borders a channel that can only be used by small tugs, which has not been surveyed. The whole island, excepting a small clearing on the east side, is densely wooded.

The west coast of the island from abreast Brebeuf Island Light trends southward nearly straight $2\frac{3}{4}$ miles, thence south southeast 1,320 yards to the southern point of the island situated $1\frac{1}{4}$ miles east southeast from Pinery Point, half mile southward from Gin Islands, the bank from Beausoleil Island is reduced to a width of 300 yards, which width continues $1\frac{1}{2}$ miles to the south point. The whole of the west coast is fringed with huge bowlders, none however lying very far off, but causing very bad landing. From the southern point of Beausoleil Island, the very shallow sand bank with 4 feet water on its outer edge extends over 1,175 yards south southeastward, being separated from the sand bank west of Present Island by a channel 590 yards wide and $4\frac{1}{2}$ fathoms deep.

Candlemas Shoal, with 8 feet of water over it, lies 590 yards southward from the south point of Beausoleil Island, being just separated from the island sand bank.

Buoy.—A black spar buoy is moored on the southwest side of the shoal, and 440 yards northeast of the fairway leading mark.

Clearing marks.—The Gap (Giants Tomb Island) in range with Adams Point, bearing 321° (NNW. $\frac{1}{4}$ W.) leads southwest. Flat Point in range with the north end of Snake Island, 134° (SE. $\frac{1}{4}$ S.) leads also on the same side of Candlemas Shoal.

The east coast of Beausoleil Island trends from its south point northeastward 1,175 yards, thence north by east 1,320 yards to the point north of the Indian village, all of it being sandy and fringed by a shallow sand bank 590 yards broad.

This Indian village is a conspicuous feature, and about 15 acres of uncultivable land is cleared round it. Westward of it the island attains an elevation of 113 feet, probably the highest part, although a bluff further north appears higher on account of its trees. Although navigable water is to be found for some distance north of the

village, a stranger should not proceed northward of the rocks joining it to Roberts Island.

Anchorage.—A vessel will find good holding ground in a large area off the sand bank fronting the east side of Beausoleil Island. The space is $1\frac{1}{2}$ miles long north and south, by 1,175 yards in least width, contained between the island sand bank and the shoals north-east of Present Island.

Gin Islands, two in number, lie off the middle of the west coast of Beausoleil Island, and are both small, about 150 yards in diameter and 14 feet high. They lie 250 yards east and west of each other, and there is no safe passage between nor east of them, nor between them and Osprey Bank. A rock with 8 feet water on it lies 100 yards from the north side of the western Gin Island; otherwise the water on the west, northwest, and south sides is deep. A rock with 14 feet water lies 590 yards southwest from the western Gin Island.

Clearing mark.—The whole of Snake Island, open southwest of Beausoleil Island, bearing 146° (SSE. $\frac{3}{4}$ E.), leads southwest of this rock.

Gin Rocks, two in number and very small, lie southward from the western Gin Island; the northern one, 3 feet high, lies on the bank fronting Beausoleil Island, and 440 yards from the western Gin Island. The southern and smaller rock, only $\frac{1}{2}$ foot out of water, has deep water all round it and is 880 yards from the same island.

Brebeuf Island, small, partially wooded, about 20 feet high, nearly circular, and 200 yards in diameter, lies 1.1 miles southeastward from Minnicog Beacon. The island is rendered conspicuous by the lighthouse upon its light-colored bare west side, which the sun usually brightens up, contrasting it with the rest of the shore. It is connected eastward with Beausoleil Island (nearly 440 yards) by a string of dry rocks and shoals; from Brebeuf Island very shoal water extends 200 yards in all directions.

Range Lights—Front Light.—A fixed white light, 40 feet above water, visible 10 miles, is shown from a white, square tower on the northern end of Brebeuf Island.

Rear Light.—A fixed white light, 87 feet above water, visible 10 miles, is shown from a red, square, skeleton tower on the western shore of Beausoleil Island. These in range lead in from outside of Bennet Bank to the alignment of Port McNicoll Range.

Note.—In the early part of the day this back tower is not easy to see, but when on the range the lights are under a small crown-shaped clump of bush with the daylight showing through it.

A rock with 15 feet water on it lies 440 yards northwestward from Brebeuf Island, with which exception the water in the bay between Brebeuf Island and the rocks and islands north of it is good.

Osprey Bank is $1\frac{1}{2}$ miles long north and south, the southern part being 1,175 yards broad; its north end is situated 880 yards westward from Brebeuf Island Light, and its southern extremity 440 yards northward of Gin Islands. On the northern half of the bank are several spots with less than 6 feet of water on them.

Clearing mark.—The southwestern side of Beausoleil Islands 153° (S. by E. $\frac{1}{4}$ E.), well open southwest of Gin Islands, leads southwest of Osprey Bank.

Muskoka Mills village is situated on Muskosh River at its entrance into Georgian Bay, and $14\frac{1}{2}$ miles by the steamboat channel northward from Penetanguishene, the nearest railway station and banking town. It contains a Union Church, post office, common school, and sawmill. A steamboat calls daily during navigation.

From the mill the shore runs southward nearly 440 yards and then eastward nearly 880 yards to Clifton Bay, with deep water close in all the way. The point thus formed is quite bare, 70 feet high, and upon it is burnt all the refuse from the mill, causing a lot of smoke that can nearly always be seen for miles outside.

Muskosh Channel is the passage leading from Gull Rock to Muskoka Mills, nearly 4 miles, and it is possible to carry a depth of 5 fathoms.

The east side of Muskosh Channel will now be taken up.

Talbot Islands, on the eastern side of Muskosh Channel, are a group of four well-wooded islands 20 feet high having deep water off their northwestern, northern, and northeastern sides. The northwestern islet of the group lies 350 yards east-northeast from the north point of Minnicoganashene Island. The group is over 590 yards long in a southeast direction and 300 yards wide. A small rock 1 foot high lies 100 yards from the east side of the group.

Hotchkiss Rock, 2 feet high, lies over 590 yards northeastward from the northern point of Minnicoganashene Island. It is very small and may be approached to 25 yards.

A slightly larger rock 13 feet high lies 200 yards southeastward from Hotchkiss Rock, and it, too, is surrounded by deep water.

Penetang Rock, 11 feet high, so called from the fact that the smaller craft using the passage east of Minnicoganashene Island on their way to Penetanguishene, leave the main ship's track here. The rock lies 440 yards east-northeast from Hotchkiss Rock, and between them is 10 fathoms of water. Penetang Rock may be approached to within 50 yards. It is the west rock of a group of islands and rocks 150 yards wide, stretching 440 yards eastward from it. The islands are 18 feet high, fairly well wooded, and may all be approached to 50 yards on all sides.

Lambart Island, 70 feet high, nearly square, with indented sides and about 440 yards in diameter, is situated $1\frac{3}{4}$ miles northeastward

from Minnicoganashene Island. Between Lambart and the Penetang Rock group is the entrance, with 12 fathoms of water in it, to a boat channel leading round the north and east sides of Beausoleil Island to Midland and Penetanguishene. There is said to be about 6 feet water through, but the survey was not extended to that locality. Deep water will be found to within 50 yards of the island.

Bather Island, 32 feet high, with only some burnt trees and ram-pikes left on it now, is situated over 1,320 yards northeast from Penetang Rock. It is about 200 yards in diameter, with a small dry rock lying 100 yards from its northwestern side, and another 50 yards from its south side. No shoal water was found lying off these. It is separated from Lambart Island by a channel 100 yards wide.

Ship Island, so called because vessels keep it close on board to avoid Otonabee Shoal, is 150 yards long north and south and quite narrow, with a considerable number of trees on it. It lies 880 yards northward from Bather Island and 300 yards from the nearest dry rock off Arthur Island. Between Bather and Ship Islands the shore is high, steep, and partially wooded, being only 100 yards back from the line of the islands. South 200 yards from Ship Island is a small rock with 10 feet least water on it, lying 100 yards from the shore.

Sugar Island, small, 15 feet high and 50 yards in diameter, lies 880 yards northward from Ship Island and 100 yards from shore. Southward 75 yards from the island is a small dry rock, and 100 yards farther in the same direction is a small rock with 5 feet water on it. A good passage exists eastward of Sugar Island, and on the western side the island and dry rock may be approached to 25 yards.

Anchorage.—A bay, 440 yards deep, runs in eastward from Sugar Island, and in it good anchorage may be had.

Bone Island, over 70 feet high, forming the south shore of the bay on which Muskoka Mills village is built, is situated with its west end 1,175 yards northward from Sugar Island. The bay south of Bone Island has as much as 14 fathoms of water in it, and eastward of Conns Shoal it is deep.

From the west end of Bone Island the south coast first trends east by south 590 yards, and then east by north 1,175 yards, forming the north shore of a long bay about 200 yards wide and deep, but usually filled with logs. The shore between Sugar Island and this bay is quite clean. A small spit makes out about 75 yards from the west end of Bone Island to a depth of 13 feet. From the same point the northwest coast trends 300 yards northeastward and then eastward 1,175 yards to the most northerly point of the island, the intervening space being taken up with a bay 200 yards deep from the line of the points.

Gwetchewan Island, about 75 yards in diameter, is a round, wooded island lying near the middle of the mouth of the bay just

mentioned, and has deep water off it. From the northern point of Bone Island the coast trends east by south 590 yards, further than which the survey was not taken.

A rock, with 17 feet least water on it, lies 250 yards northeastward from the northern point of Bone Island, being situated on a bank otherwise over 5 fathoms deep making out from an island 7 feet high 350 yards east of the shoal.

In the bay south of Muskoka mills depths from 10 to 20 fathoms will be found.

On the western side of Muskosk Channel are—

Gull Rock, 4 feet high, is the outer of three dry rocks running from the southeast point of Kindersley Island; it is 100 yards long northwest, and quite narrow. There is very little shallow water on its southwestern, southern, and eastern sides, but no deep passage exists between it and Kindersley Island. A rock with 6 feet water on it lies 350 yards westward from Gull Rock, and, standing out well into Whalesback Channel, must be guarded against.

McLeod Island is well wooded, the trees making it show up dark and conspicuous from all directions from which it can be seen. It is situated 590 yards southeast of Pudding Island, and is 300 yards long east and west, by 100 yards in greatest width. Some dry rocks lie 300 yards off its southern side, and from the most southerly of these a bank extends southeastward 150 yards to a depth of 15 feet. A rock with 7 feet of water on it lies 150 yards southeastward from the southeast point of McLeod Island.

McLeod Island and its rocks mark the end of a large group of islands and rocks separating Muskoka Landing Channel from Muskoka Channel.

Buller Island, 19 feet high and about 75 yards in diameter, is situated 200 yards northeastward of McLeod Island. It is wooded and shows up conspicuously after rounding McLeod Island. Buller Island forms the southeast entrance point of a bay that runs northwestward nearly 1 mile from it. This bay has a nearly uniform width of 200 yards and limited, but good anchorage may be had in it in 4 to 7 fathoms. From the northwest end of the bay a boat channel runs to Muskoka Landing. Buller Island has deep water close to its east and north sides.

Manitou Point is a rather high and nearly dry bare flat point lying just north of McLeod Island. It forms the southwest shore of the long bay and anchorage alluded to in the last paragraph. It is also the southeast end of an island over 1 mile in length, northwest end of which is known as Wabend Point.

Beacon.—On the southwest side of this island and nearly 880 yards southward from Wabend point is erected a beacon painted white, which in range with a similar beacon on a rock on the north-

west side of Ava Island, bearing 53° (NE. by E. $\frac{3}{4}$ E.), leads out from the Whalesback to Giant's Tomb Island, with 16 feet of water (in low stages there may be 2 feet less).

Portage Point is the narrow southeast end of Portage Island, the southwest coast of which forms the northeast side of the anchorage above alluded to. The island north and south is nearly $1\frac{1}{4}$ miles long by 1,175 yards in extreme breadth. Deep water approaches quite close to the east, southeast, south, and southwest sides of Portage Point.

A shoal with 13 feet least water on it lies 1,175 yards east-southeast from Portage Point.

Waback Island, about 40 feet high and wooded, is just separated on its northwest and west sides from Portage Island. Its southeast point is situated over 880 yards northeastward from McLeod Island. The island is pear shaped, the butt being toward the northwest, in which direction it is nearly 880 yards long by nearly 440 yards in greatest breadth. The southeast and only important point of the island has deep water 50 yards from its south, southeast, and east sides.

Anchorage.—Among the islands lying between Minnicoganashene Island and Muskoka Mills anchorages are scarce on account of deep water and narrow channels, but southeast of Waback Island is a large bank under 10 fathoms, and good anchorage in any desirable depth can be had on it.

Arthur (Minnewawa) Island is situated nearly 1 mile northeastward from McLeod Island, is very irregular in shape, 440 yards wide north and south, and 880 yards long east and west. The island is about 50 feet high and thickly wooded, except the eastern or higher half, which has been partially burned. The owner has a summer house on it, but it can hardly be seen in the trees. There may be a channel between it and Waback Island, but it would be narrow and crooked, its western point being only separated from both Portage and Waback Islands by 200 yards. From the south point of the island dry reefs extend east-southeast 200 yards.

Ontonabee Shoal lies 100 yards southeast from the outer reef above mentioned, and is the most awkward danger in Muskoka Channel.

Delasco Island, about 20 feet high, 40 yards in diameter, and thinly wooded, lies 340 yards northward from the northeast point of Arthur Island. Shallow water connects the two, and a spit with a small dry rock on it makes out northward 100 yards to a depth of 12 feet, but the east side is quite steep-to.

Conns Shoal, with 10 feet least water on it, lies north by west a little more than 440 yards from Delasco Island, and another with 9

feet least water on it lies a little less than 440 yards northwestward from the same island.

Sweatman Island, high and thickly wooded with dark pines, lies nearly 880 yards northwest from Delasco Island. It is 300 yards long in a northwest direction, by 100 yards in width. A small rock 10 feet high lies 75 yards from its south point. Deep water approaches close to both this rock and Sweatman Island.

Mitawangah Island lies with its northeast point nearly 1,320 yards northward from Delasco Island. It is 65 feet high, the top being nearly bare while the lower part is fairly well wooded. It is 590 yards long east-northeast, by 150 yards wide. Deep water approaches close to its north and southeast sides.

Brown Bay, of which the north point of Mitawangah Island may be said to be the southwest entrance point, extends 1,320 yards in a northwest direction. The bay has only an average width of 200 yards with 13 fathoms of water at the entrance, but, about the middle, good though limited anchorage may be had in 5 to 7 fathoms.

Brown Head is a prominent headland forming the northeast entrance point of Brown Bay, and situated 1 mile northward from Delasco Island. The channel between Brown Head and Bone Island is only 200 yards wide, but the water is 9 fathoms deep and the shores clean.

Longuissa Point was well marked in 1893 by a large, conspicuous house, painted red, 250 yards from the extreme point, situated 590 yards northeast from Brown Head. The point is almost 60 feet high, bare, with deep water close to it.

Longuissa Bay, long and narrow, runs in 880 yards on the southwest side of the above point but is too narrow for anchorage. A small rock 1 foot high is situated 350 yards west-southwest from Longuissa Point with very deep water between them.

The northeast side of Longuissa Point trends in a north-northwest direction 880 yards forming the west shore of the bay upon which Muskoka Mills Village is built. Cribwork, upon which to pile lumber, has been built nearly all along the shore.

Wales Rock, with only 7 feet of water on it, lies 200 yards northward from the extremity of Longuissa Point and 75 yards eastward from the south end of the cribwork. Vessels approaching the cribwork to load lumber should be careful to avoid it.

The wharf in connection with the mill, at which 12 feet of water (at low stages there may be 2 feet less) may be had, is situated on the north shore of the bay, 880 yards northeastward from Longuissa Point. From the wharf the north shore of the bay trends west nearly 880 yards, being all cribbed to give piling ground for the product of the mill. Vessels of larger draft have to load either on the

southwest side of the bay, or at the crib detached from the north shore.

Directions for Muskosh Channel.—In this channel the master of a vessel is advised to follow the track as shown on the chart, as the water is all deep and shoals scarce, the principal ones to avoid being Otonabee Shoal, the 5-foot rock south of Sugar Island, Conns Shoal, and Wales Rock.

Muskoka Landing Channel is that part of Inside Channel between Townsend Island and Hotchkiss Rock. Townsend and Newton Islands forming the entrance points from the northwest, are clean outside for 50 yards.

Cognashene Point is the west point of a large island, and is situated 1,175 yards southeast from Townsend Island. The point is very bluff and steep to, making it a safe point for vessels to approach. The trees, too, on it, make it very marked, but during 1893 many of the trees were accidentally burned.

Between Townsend Island and Cognashene Point are a couple of small islands lying close northeastward of the channel. These are fairly well wooded, and are quite steep-to. There is a large bay northeast of these islands and good anchorage, but the entrance close to Cognashene Point is not to be recommended to a stranger.

Birchall Island, 19 feet high and about 100 yards in diameter, is a conspicuous island lying 440 yards southeast from Cognashene Point. It forms one of a string of small islands shutting in Kenebec Island, one of the large islands in the vicinity. It is important, too, on account of the very shoal water making out from it 75 yards into the narrow channel.

Freddy Channel is a small tug channel dredged to 9 feet of water (1916), running from Muskoka Landing (the wharf on Maxwell Island) to Muskoka Mills and passing southeast of and close to Birchall Island. The general trend of the channel is 55° (NE. by E. $\frac{1}{2}$ E.) and distance to Muskoka Mills 3.3 miles.

Buoy.—A black spar buoy marks the southern extremity of Barnard Bank.

Beacons, buoys.—On the north shore of Freddy Channel north of Portage Island are erected two day beacons which lead through the dredged channel at this point. The dredged channel is marked by six spar buoys, three red and three black.

Hewis Rocks form a group of small dry rocks 150 yards off Muskoka Landing and very shoal water makes out from them west-southwest 75 yards, but the channel between this shoal water and the wharf is quite clean and 5 fathoms deep.

A very small rock, just covered, lies 250 yards southeast from Muskoka Landing. It is very important, as it narrows the channel to less than 100 yards, but 4 fathoms deep, and there is no passage

northeastward of it. Shoal water extends from it 100 yards south-east.

Long Point Island, so called from its long, low, bare point stretching southward, is situated 1,320 yards southeastward from Cognashene Point, and 440 yards from Muskoka Landing. Long Point Island is 15 feet high and irregular in shape, 250 yards long in a north-northeast direction by nearly the same width, and is important as marking the south end of the narrow portion of Muskoka Landing Channel. No shoal water makes out from it toward the channel.

Glacis Island, 19 feet high, is a very small island, well wooded, with a steep bare western face. Shoal water stretches from Long Point Island nearly across to Glacis Island, which is itself steep-to on its south and west sides. It lies 350 yards southeastward from Long Point Island.

Pudding Island, 10 feet high, is a very small island, bare of trees, lying 590 yards southeastward from Glacis Island. It has a dangerous spit extending 150 yards south-southeast where will be found a depth of 5 feet. Between Glacis and Pudding Islands are two larger well wooded islands, but, being lower and farther from the track, are less important.

A rock awash lies 200 yards west-southwest from Pudding Island, and is connected by slightly deeper water with a reef lying 100 yards northwest of the same island. A small islet 40 yards in diameter and 15 feet high lies 300 yards southeast from Pudding Island, and a shoal with 7 feet least water on it lies 250 yards south from it.

Cupid Island, very small, 9 feet high, and lying just off the east side of Aberdeen Island, the largest in the group, is situated 140 yards south from the nearest part of Cognashene Point. The island is round, almost bare, and quite steep-to, making thus a good turning point in the channel.

A rock with only 5 feet of water on it lies 350 yards southeastward from Cupid Island. It is the outer end of a spit making out from the islands in the bight between Cupid Island and Muskoka Landing. Being abreast of Birchall Island Reef, it is especially awkward, as the channel is narrowed to 75 yards, although having 5 fathoms water in it. To pass through this narrow place, keep the islands between Townsend Island and Cognashene Point just open northeast of Cupid Island, bearing 313° (NW. $\frac{1}{2}$ N.).

Aberdeen Island is irregular in shape, over 590 yards in greatest length, and 440 yards in greatest breadth. It is well wooded with small pine, poplar, and birch.

Maxwell Island is principally important on account of the small wharf known as Muskoka Landing.

Muskoka Landing, erected upon its east side to facilitate the landing of passengers and mail for Muskosh or Muskoka Mills from the local steamer running from Midland and Penetanguishene to Parry Sound Harbor. Muskoka Landing is nearly 1,175 yards southeast from Cognashene Point.

The island is 880 yards long in a north-northwest direction and 300 yards in extreme width; the east side is unbroken and steep-to, the west side on the contrary being broken up.

Vessels using Inside Channel must keep Maxwell Island close on board as the channel is very narrow, though 4 fathoms can be carried through, and vessels drawing 12 feet could in 1893 lie at Muskoka Landing Wharf.

Buoy.—A red spar buoy marks the east side of the channel abreast the middle of Maxwell Island.

Ava Island just separated from Maxwell Island, is high and sparsely wooded, 440 yards long in a north-northwest direction and 200 yards wide, the east shore being steep-to.

Beacon.—On a rock in the northwest side of Ava Island is erected a beacon, which in conjunction with another on Wabend Point bearing 53° (NE. by E. $\frac{3}{4}$ E.) leads a vessel from a position 590 yards southeast of Giant's Tomb Lighthouse to the entrance of Whalesback Channel, with 16 feet water (in low stages there may be 2 feet less).

A rock awash lies 440 yards southwest of Ava Island Beacon and 250 yards northeast from the Whalesback; it has deep water all round it, but narrows the entrance of Whalesback Channel to 250 yards with depth of 14 fathoms.

Kindersley Island, 22 feet high, situated close southeast of Ava Island, is 440 yards long in a northwest direction and 150 yards in greatest width; it is only sparsely wooded, but is rather conspicuous by reason of its light color. Small dry rocks, and a rock with 13 feet water upon it, will be found 100 yards off its northeast side. A rock 100 yards long and 40 yards wide, lies close west of its northwest point; and between this rock and Ava Island will be found a narrow channel through which a depth of 11 feet can be carried with the assistance of buoys.

Smooth Island protects Minnicog Channel on the southwest. It lies with its northwest sharp point 440 yards southwest of Keating Island. The island is thinly wooded, about 20 feet high, a little more than 1,320 yards long in a northwesterly direction, and 350 yards in extreme width. The north side is nearly straight and the southeast end made up of several small rocks.

There is no safe passage for vessels between Keating and Smooth Islands. Dry rocks stretch off from the northwest point of Smooth Island in a northwest by west direction nearly 880 yards, and rocks

awash lie nearly 1,320 yards farther in the same direction. Shoals continue still farther nearly to the track from the southwest to Whalesback Channel.

While it is hardly true to say there are no channels through the above shoals, still there is no channel that can be recommended without the aid of buoys and beacons. One such channel leading from the south end of Giant's Tomb Island has been marked out by range beacons, and that is the only one used at present.

Minnicoganashene Island lying nearly 440 yards southeast from Governor Island, is a large conspicuous island in the approach to Muskoka Mills, having upon its summit a conspicuous summer residence. It is 60 feet high, but the trees add greatly to that. The island has the shape of an irregular right angled triangle, the right angle being at the southwestern point. The north point is situated 590 yards southward from Gull Rock, and its greatest length north and south is 1,320 yards.

The northwestern side of the island is indented with several shallow covers. The south coast is only slightly indented with a shallow bay, while the northeast coast is nearly straight, but of little importance, there being no channel near it. The northwest and channel side is quite steep-to, as also the sharp north point.

From the southwest point a shallow rocky spit makes out in a northwesterly direction 300 yards to 12 feet of water, with only 5 feet halfway. This spit taken in conjunction with the bank from Keating Island narrows the channel to 150 yards, with a depth of 6 fathoms, but as vessels using this channel do not draw more than 11 feet, the passage is quite wide enough.

Buoy.—A red spar buoy is moored west of the above spit.

Alice Rock is very small and about 5 feet high, lying in Minnicog Channel (as the stretch of water from Governor Island to Minnicog Beacon is called) and nearly 440 yards northward from the southeast end of Smooth Island.

A rock with only 5 feet water on it lies 80 yards eastward from Alice Rock, compelling vessels to keep the islet lying near the south side of Minnicoganashene Island very close on board, this portion of the south coast of the island being steep-to. A vessel can pass close southwest of Alice Rock, but the former passage is always used.

Governor (Thompson) Island lies 880 yards southeast from the Whalesback Group and a little less than that distance southwest from Gull Rock; the island is crescent shaped concave to the north, the distance between the horns being nearly 1,320 yards, the bay inclosed being of no use, though it appeared deep. The east and south sides are so steep-to that the surveying steamer *Bayfield* and tugs often made fast to its trees in 1893. Two rocks lie respectively

village, a stranger should not proceed northward of the rocks joining it to Roberts Island.

Anchorage.—A vessel will find good holding ground in a large area off the sand bank fronting the east side of Beausoleil Island. The space is $1\frac{1}{2}$ miles long north and south, by 1,175 yards in least width, contained between the island sand bank and the shoals north-east of Present Island.

Gin Islands, two in number, lie off the middle of the west coast of Beausoleil Island, and are both small, about 150 yards in diameter and 14 feet high. They lie 250 yards east and west of each other, and there is no safe passage between nor east of them, nor between them and Osprey Bank. A rock with 8 feet water on it lies 100 yards from the north side of the western Gin Island; otherwise the water on the west, northwest, and south sides is deep. A rock with 14 feet water lies 590 yards southwest from the western Gin Island.

Clearing mark.—The whole of Snake Island, open southwest of Beausoleil Island, bearing 146° (SSE. $\frac{1}{2}$ E.), leads southwest of this rock.

Gin Rocks, two in number and very small, lie southward from the western Gin Island; the northern one, 3 feet high, lies on the bank fronting Beausoleil Island, and 440 yards from the western Gin Island. The southern and smaller rock, only $\frac{1}{2}$ foot out of water, has deep water all round it and is 880 yards from the same island.

Brebeuf Island, small, partially wooded, about 20 feet high, nearly circular, and 200 yards in diameter, lies 1.1 miles southeastward from Minnicog Beacon. The island is rendered conspicuous by the lighthouse upon its light-colored bare west side, which the sun usually brightens up, contrasting it with the rest of the shore. It is connected eastward with Beausoleil Island (nearly 440 yards) by a string of dry rocks and shoals; from Brebeuf Island very shoal water extends 200 yards in all directions.

Range Lights—Front Light.—A fixed white light, 40 feet above water, visible 10 miles, is shown from a white, square tower on the northern end of Brebeuf Island.

Rear Light.—A fixed white light, 87 feet above water, visible 10 miles, is shown from a red, square, skeleton tower on the western shore of Beausoleil Island. These in range lead in from outside of Bennet Bank to the alignment of Port McNicoll Range.

Note.—In the early part of the day this back tower is not easy to see, but when on the range the lights are under a small crown-shaped clump of bush with the daylight showing through it.

A rock with 15 feet water on it lies 440 yards northwestward from Brebeuf Island, with which exception the water in the bay between Brebeuf Island and the rocks and islands north of it is good.

Osprey Bank is $1\frac{1}{2}$ miles long north and south, the southern part being 1,175 yards broad; its north end is situated 880 yards westward from Brebeuf Island Light, and its southern extremity 440 yards northward of Gin Islands. On the northern half of the bank are several spots with less than 6 feet of water on them.

Clearing mark.—The southwestern side of Beausoleil Islands 153° (S. by E. $\frac{1}{4}$ E.), well open southwest of Gin Islands, leads southwest of Osprey Bank.

Muskoka Mills village is situated on Muskosh River at its entrance into Georgian Bay, and $14\frac{1}{2}$ miles by the steamboat channel northward from Penetanguishene, the nearest railway station and banking town. It contains a Union Church, post office, common school, and sawmill. A steamboat calls daily during navigation.

From the mill the shore runs southward nearly 440 yards and then eastward nearly 880 yards to Clifton Bay, with deep water close in all the way. The point thus formed is quite bare, 70 feet high, and upon it is burnt all the refuse from the mill, causing a lot of smoke that can nearly always be seen for miles outside.

Muskosh Channel is the passage leading from Gull Rock to Muskoka Mills, nearly 4 miles, and it is possible to carry a depth of 5 fathoms.

The east side of Muskosh Channel will now be taken up.

Talbot Islands, on the eastern side of Muskosh Channel, are a group of four well-wooded islands 20 feet high having deep water off their northwestern, northern, and northeastern sides. The northwestern islet of the group lies 350 yards east-northeast from the north point of Minnicoganashene Island. The group is over 590 yards long in a southeast direction and 300 yards wide. A small rock 1 foot high lies 100 yards from the east side of the group.

Hotchkiss Rock, 2 feet high, lies over 590 yards northeastward from the northern point of Minnicoganashene Island. It is very small and may be approached to 25 yards.

A slightly larger rock 13 feet high lies 200 yards southeastward from Hotchkiss Rock, and it, too, is surrounded by deep water.

Penetang Rock, 11 feet high, so called from the fact that the smaller craft using the passage east of Minnicoganashene Island on their way to Penetanguishene, leave the main ship's track here. The rock lies 440 yards east-northeast from Hotchkiss Rock, and between them is 10 fathoms of water. Penetang Rock may be approached to within 50 yards. It is the west rock of a group of islands and rocks 150 yards wide, stretching 440 yards eastward from it. The islands are 18 feet high, fairly well wooded, and may all be approached to 50 yards on all sides.

Lambart Island, 70 feet high, nearly square, with indented sides and about 440 yards in diameter, is situated $1\frac{1}{2}$ miles northeastward

from Minnicoganashene Island. Between Lambart and the Penetang Rock group is the entrance, with 12 fathoms of water in it, to a boat channel leading round the north and east sides of Beausoleil Island to Midland and Penetanguishene. There is said to be about 6 feet water through, but the survey was not extended to that locality. Deep water will be found to within 50 yards of the island.

Bather Island, 32 feet high, with only some burnt trees and ram-pikes left on it now, is situated over 1,320 yards northeast from Penetang Rock. It is about 200 yards in diameter, with a small dry rock lying 100 yards from its northwestern side, and another 50 yards from its south side. No shoal water was found lying off these. It is separated from Lambart Island by a channel 100 yards wide.

Ship Island, so called because vessels keep it close on board to avoid Otonabee Shoal, is 150 yards long north and south and quite narrow, with a considerable number of trees on it. It lies 880 yards northward from Bather Island and 300 yards from the nearest dry rock off Arthur Island. Between Bather and Ship Islands the shore is high, steep, and partially wooded, being only 100 yards back from the line of the islands. South 200 yards from Ship Island is a small rock with 10 feet least water on it, lying 100 yards from the shore.

Sugar Island, small, 15 feet high and 50 yards in diameter, lies 880 yards northward from Ship Island and 100 yards from shore. Southward 75 yards from the island is a small dry rock, and 100 yards farther in the same direction is a small rock with 5 feet water on it. A good passage exists eastward of Sugar Island, and on the western side the island and dry rock may be approached to 25 yards.

Anchorage.—A bay, 440 yards deep, runs in eastward from Sugar Island, and in it good anchorage may be had.

Bone Island, over 70 feet high, forming the south shore of the bay on which Muskoka Mills village is built, is situated with its west end 1,175 yards northward from Sugar Island. The bay south of Bone Island has as much as 14 fathoms of water in it, and eastward of Conns Shoal it is deep.

From the west end of Bone Island the south coast first trends east by south 590 yards, and then east by north 1,175 yards, forming the north shore of a long bay about 200 yards wide and deep, but usually filled with logs. The shore between Sugar Island and this bay is quite clean. A small spit makes out about 75 yards from the west end of Bone Island to a depth of 13 feet. From the same point the northwest coast trends 300 yards northeastward and then eastward 1,175 yards to the most northerly point of the island, the intervening space being taken up with a bay 200 yards deep from the line of the points.

Gwetchewan Island, about 75 yards in diameter, is a round, wooded island lying near the middle of the mouth of the bay just

mentioned, and has deep water off it. From the northern point of Bone Island the coast trends east by south 590 yards, further than which the survey was not taken.

A rock, with 17 feet least water on it, lies 250 yards northeastward from the northern point of Bone Island, being situated on a bank otherwise over 5 fathoms deep making out from an island 7 feet high 350 yards east of the shoal.

In the bay south of Muskoka mills depths from 10 to 20 fathoms will be found.

On the western side of Muskosk Channel are—

Gull Rock, 4 feet high, is the outer of three dry rocks running from the southeast point of Kindersley Island; it is 100 yards long northwest, and quite narrow. There is very little shallow water on its southwestern, southern, and eastern sides, but no deep passage exists between it and Kindersley Island. A rock with 6 feet water on it lies 350 yards westward from Gull Rock, and, standing out well into Whalesback Channel, must be guarded against.

McLeod Island is well wooded, the trees making it show up dark and conspicuous from all directions from which it can be seen. It is situated 590 yards southeast of Pudding Island, and is 300 yards long east and west, by 100 yards in greatest width. Some dry rocks lie 300 yards off its southern side, and from the most southerly of these a bank extends southeastward 150 yards to a depth of 15 feet. A rock with 7 feet of water on it lies 150 yards southeastward from the southeast point of McLeod Island.

McLeod Island and its rocks mark the end of a large group of islands and rocks separating Muskoka Landing Channel from Muskoka Channel.

Buller Island, 19 feet high and about 75 yards in diameter, is situated 200 yards northeastward of McLeod Island. It is wooded and shows up conspicuously after rounding McLeod Island. Buller Island forms the southeast entrance point of a bay that runs northwestward nearly 1 mile from it. This bay has a nearly uniform width of 200 yards and limited, but good anchorage may be had in it in 4 to 7 fathoms. From the northwest end of the bay a boat channel runs to Muskoka Landing. Buller Island has deep water close to its east and north sides.

Manitou Point is a rather high and nearly dry bare flat point lying just north of McLeod Island. It forms the southwest shore of the long bay and anchorage alluded to in the last paragraph. It is also the southeast end of an island over 1 mile in length, northwest end of which is known as Wabend Point.

Beacon.—On the southwest side of this island and nearly 880 yards southward from Wabend point is erected a beacon painted white, which in range with a similar beacon on a rock on the north-

west side of Ava Island, bearing 53° (NE. by E. $\frac{3}{4}$ E.), leads out from the Whalesback to Giant's Tomb Island, with 16 feet of water (in low stages there may be 2 feet less).

Portage Point is the narrow southeast end of Portage Island, the southwest coast of which forms the northeast side of the anchorage above alluded to. The island north and south is nearly $1\frac{1}{4}$ miles long by 1,175 yards in extreme breadth. Deep water approaches quite close to the east, southeast, south, and southwest sides of Portage Point.

A shoal with 13 feet least water on it lies 1,175 yards east-southeast from Portage Point.

Waback Island, about 40 feet high and wooded, is just separated on its northwest and west sides from Portage Island. Its southeast point is situated over 880 yards northeastward from McLeod Island. The island is pear shaped, the butt being toward the northwest, in which direction it is nearly 880 yards long by nearly 440 yards in greatest breadth. The southeast and only important point of the island has deep water 50 yards from its south, southeast, and east sides.

Anchorage.—Among the islands lying between Minnicoganashene Island and Muskoka Mills anchorages are scarce on account of deep water and narrow channels, but southeast of Waback Island is a large bank under 10 fathoms, and good anchorage in any desirable depth can be had on it.

Arthur (Minnewawa) Island is situated nearly 1 mile northeastward from McLeod Island, is very irregular in shape, 440 yards wide north and south, and 880 yards long east and west. The island is about 50 feet high and thickly wooded, except the eastern or higher half, which has been partially burned. The owner has a summer house on it, but it can hardly be seen in the trees. There may be a channel between it and Waback Island, but it would be narrow and crooked, its western point being only separated from both Portage and Waback Islands by 200 yards. From the south point of the island dry reefs extend east-southeast 200 yards.

Ontonabee Shoal lies 100 yards southeast from the outer reef above mentioned, and is the most awkward danger in Muskoka Channel.

Delasco Island, about 20 feet high, 40 yards in diameter, and thinly wooded, lies 340 yards northward from the northeast point of Arthur Island. Shallow water connects the two, and a spit with a small dry rock on it makes out northward 100 yards to a depth of 12 feet, but the east side is quite steep-to.

Conns Shoal, with 10 feet least water on it, lies north by west a little more than 440 yards from Delasco Island, and another with 9

feet least water on it lies a little less than 440 yards northwestward from the same island.

Sweatman Island, high and thickly wooded with dark pines, lies nearly 880 yards northwest from Delasco Island. It is 300 yards long in a northwest direction, by 100 yards in width. A small rock 10 feet high lies 75 yards from its south point. Deep water approaches close to both this rock and Sweatman Island.

Mitawangah Island lies with its northeast point nearly 1,320 yards northward from Delasco Island. It is 65 feet high, the top being nearly bare while the lower part is fairly well wooded. It is 590 yards long east-northeast, by 150 yards wide. Deep water approaches close to its north and southeast sides.

Brown Bay, of which the north point of Mitawangah Island may be said to be the southwest entrance point, extends 1,320 yards in a northwest direction. The bay has only an average width of 200 yards with 13 fathoms of water at the entrance, but, about the middle, good though limited anchorage may be had in 5 to 7 fathoms.

Brown Head is a prominent headland forming the northeast entrance point of Brown Bay, and situated 1 mile northward from Delasco Island. The channel between Brown Head and Bone Island is only 200 yards wide, but the water is 9 fathoms deep and the shores clean.

Longuissa Point was well marked in 1893 by a large, conspicuous house, painted red, 250 yards from the extreme point, situated 590 yards northeast from Brown Head. The point is almost 60 feet high, bare, with deep water close to it.

Longuissa Bay, long and narrow, runs in 880 yards on the southwest side of the above point but is too narrow for anchorage. A small rock 1 foot high is situated 350 yards west-southwest from Longuissa Point with very deep water between them.

The northeast side of Longuissa Point trends in a north-northwest direction 880 yards forming the west shore of the bay upon which Muskoka Mills Village is built. Cribwork, upon which to pile lumber, has been built nearly all along the shore.

Wales Rock, with only 7 feet of water on it, lies 200 yards northward from the extremity of Longuissa Point and 75 yards eastward from the south end of the cribwork. Vessels approaching the cribwork to load lumber should be careful to avoid it.

The wharf in connection with the mill, at which 12 feet of water (at low stages there may be 2 feet less) may be had, is situated on the north shore of the bay, 880 yards northeastward from Longuissa Point. From the wharf the north shore of the bay trends west nearly 880 yards, being all cribbed to give piling ground for the product of the mill. Vessels of larger draft have to load either on the

southwest side of the bay, or at the crib detached from the north shore.

Directions for Muskosh Channel.—In this channel the master of a vessel is advised to follow the track as shown on the chart, as the water is all deep and shoals scarce, the principal ones to avoid being Otonabee Shoal, the 5-foot rock south of Sugar Island, Conns Shoal, and Wales Rock.

Muskoka Landing Channel is that part of Inside Channel between Townsend Island and Hotchkiss Rock. Townsend and Newton Islands forming the entrance points from the northwest, are clean outside for 50 yards.

Cognashene Point is the west point of a large island, and is situated 1,175 yards southeast from Townsend Island. The point is very bluff and steep to, making it a safe point for vessels to approach. The trees, too, on it, make it very marked, but during 1893 many of the trees were accidentally burned.

Between Townsend Island and Cognashene Point are a couple of small islands lying close northeastward of the channel. These are fairly well wooded, and are quite steep-to. There is a large bay northeast of these islands and good anchorage, but the entrance close to Cognashene Point is not to be recommended to a stranger.

Birchall Island, 19 feet high and about 100 yards in diameter, is a conspicuous island lying 440 yards southeast from Cognashene Point. It forms one of a string of small islands shutting in Kenebec Island, one of the large islands in the vicinity. It is important, too, on account of the very shoal water making out from it 75 yards into the narrow channel.

Freddy Channel is a small tug channel dredged to 9 feet of water (1916), running from Muskoka Landing (the wharf on Maxwell Island) to Muskoka Mills and passing southeast of and close to Birchall Island. The general trend of the channel is 55° (NE. by E. $\frac{1}{2}$ E.) and distance to Muskoka Mills 3.3 miles.

Buoy.—A black spar buoy marks the southern extremity of Barnard Bank.

Beacons, buoys.—On the north shore of Freddy Channel north of Portage Island are erected two day beacons which lead through the dredged channel at this point. The dredged channel is marked by six spar buoys, three red and three black.

Hewis Rocks form a group of small dry rocks 150 yards off Muskoka Landing and very shoal water makes out from them west-southwest 75 yards, but the channel between this shoal water and the wharf is quite clean and 5 fathoms deep.

A very small rock, just covered, lies 250 yards southeast from Muskoka Landing. It is very important, as it narrows the channel to less than 100 yards, but 4 fathoms deep, and there is no passage

northeastward of it. Shoal water extends from it 100 yards south-east.

Long Point Island, so called from its long, low, bare point stretching southward, is situated 1,320 yards southeastward from Cognashene Point, and 440 yards from Muskoka Landing. Long Point Island is 15 feet high and irregular in shape, 250 yards long in a north-northeast direction by nearly the same width, and is important as marking the south end of the narrow portion of Muskoka Landing Channel. No shoal water makes out from it toward the channel.

Glacis Island, 19 feet high, is a very small island, well wooded, with a steep bare western face. Shoal water stretches from Long Point Island nearly across to Glacis Island, which is itself steep-to on its south and west sides. It lies 350 yards southeastward from Long Point Island.

Pudding Island, 10 feet high, is a very small island, bare of trees, lying 590 yards southeastward from Glacis Island. It has a dangerous spit extending 150 yards south-southeast where will be found a depth of 5 feet. Between Glacis and Pudding Islands are two larger well wooded islands, but, being lower and farther from the track, are less important.

A rock awash lies 200 yards west-southwest from Pudding Island, and is connected by slightly deeper water with a reef lying 100 yards northwest of the same island. A small islet 40 yards in diameter and 15 feet high lies 300 yards southeast from Pudding Island, and a shoal with 7 feet least water on it lies 250 yards south from it.

Cupid Island, very small, 9 feet high, and lying just off the east side of Aberdeen Island, the largest in the group, is situated 140 yards south from the nearest part of Cognashene Point. The island is round, almost bare, and quite steep-to, making thus a good turning point in the channel.

A rock with only 5 feet of water on it lies 350 yards southeastward from Cupid Island. It is the outer end of a spit making out from the islands in the bight between Cupid Island and Muskoka Landing. Being abreast of Birchall Island Reef, it is especially awkward, as the channel is narrowed to 75 yards, although having 5 fathoms water in it. To pass through this narrow place, keep the islands between Townsend Island and Cognashene Point just open northeast of Cupid Island, bearing 313° (NW. $\frac{1}{2}$ N.).

Aberdeen Island is irregular in shape, over 590 yards in greatest length, and 440 yards in greatest breadth. It is well wooded with small pine, poplar, and birch.

Maxwell Island is principally important on account of the small wharf known as Muskoka Landing.

Muskoka Landing, erected upon its east side to facilitate the landing of passengers and mail for Muskosh or Muskoka Mills from the local steamer running from Midland and Penetanguishene to Parry Sound Harbor. Muskoka Landing is nearly 1,175 yards south-east from Cognashene Point.

The island is 880 yards long in a north-northwest direction and 300 yards in extreme width; the east side is unbroken and steep-to, the west side on the contrary being broken up.

Vessels using Inside Channel must keep Maxwell Island close on board as the channel is very narrow, though 4 fathoms can be carried through, and vessels drawing 12 feet could in 1893 lie at Muskoka Landing Wharf.

Buoy.—A red spar buoy marks the east side of the channel abreast the middle of Maxwell Island.

Ava Island just separated from Maxwell Island, is high and sparsely wooded, 440 yards long in a north-northwest direction and 200 yards wide, the east shore being steep-to.

Beacon.—On a rock in the northwest side of Ava Island is erected a beacon, which in conjunction with another on Wabend Point bearing 53° (NE. by E. $\frac{1}{2}$ E.) leads a vessel from a position 590 yards southeast of Giant's Tomb Lighthouse to the entrance of Whalesback Channel, with 16 feet water (in low stages there may be 2 feet less).

A rock awash lies 440 yards southwest of Ava Island Beacon and 250 yards northeast from the Whalesback; it has deep water all round it, but narrows the entrance of Whalesback Channel to 250 yards with depth of 14 fathoms.

Kindersley Island, 22 feet high, situated close southeast of Ava Island, is 440 yards long in a northwest direction and 150 yards in greatest width; it is only sparsely wooded, but is rather conspicuous by reason of its light color. Small dry rocks, and a rock with 13 feet water upon it, will be found 100 yards off its northeast side. A rock 100 yards long and 40 yards wide, lies close west of its northwest point; and between this rock and Ava Island will be found a narrow channel through which a depth of 11 feet can be carried with the assistance of buoys.

Smooth Island protects Minnicog Channel on the southwest. It lies with its northwest sharp point 440 yards southwest of Keating Island. The island is thinly wooded, about 20 feet high, a little more than 1,320 yards long in a northwesterly direction, and 350 yards in extreme width. The north side is nearly straight and the southeast end made up of several small rocks.

There is no safe passage for vessels between Keating and Smooth Islands. Dry rocks stretch off from the northwest point of Smooth Island in a northwest by west direction nearly 880 yards, and rocks

awash lie nearly 1,320 yards farther in the same direction. Shoals continue still farther nearly to the track from the southwest to Whalesback Channel.

While it is hardly true to say there are no channels through the above shoals, still there is no channel that can be recommended without the aid of buoys and beacons. One such channel leading from the south end of Giant's Tomb Island has been marked out by range beacons, and that is the only one used at present.

Minnicoganashene Island lying nearly 440 yards southeast from Governor Island, is a large conspicuous island in the approach to Muskoka Mills, having upon its summit a conspicuous summer residence. It is 60 feet high, but the trees add greatly to that. The island has the shape of an irregular right angled triangle, the right angle being at the southwestern point. The north point is situated 590 yards southward from Gull Rock, and its greatest length north and south is 1,320 yards.

The northwestern side of the island is indented with several shallow covers. The south coast is only slightly indented with a shallow bay, while the northeast coast is nearly straight, but of little importance, there being no channel near it. The northwest and channel side is quite steep-to, as also the sharp north point.

From the southwest point a shallow rocky spit makes out in a northwesterly direction 300 yards to 12 feet of water, with only 5 feet halfway. This spit taken in conjunction with the bank from Keating Island narrows the channel to 150 yards, with a depth of 6 fathoms, but as vessels using this channel do not draw more than 11 feet, the passage is quite wide enough.

Buoy.—A red spar buoy is moored west of the above spit.

Alice Rock is very small and about 5 feet high, lying in Minnicog Channel (as the stretch of water from Governor Island to Minnicog Beacon is called) and nearly 440 yards northward from the southeast end of Smooth Island.

A rock with only 5 feet water on it lies 80 yards eastward from Alice Rock, compelling vessels to keep the islet lying near the south side of Minnicoganashene Island very close on board, this portion of the south coast of the island being steep-to. A vessel can pass close southwest of Alice Rock, but the former passage is always used.

Governor (Thompson) Island lies 880 yards southeast from the Whalesback Group and a little less than that distance southwest from Gull Rock; the island is crescent shaped concave to the north, the distance between the horns being nearly 1,320 yards, the bay inclosed being of no use, though it appeared deep. The east and south sides are so steep-to that the surveying steamer *Bayfield* and tugs often made fast to its trees in 1893. Two rocks lie respectively

200 yards and 440 yards northwest from the northeast horn of Governor Island, the former with 4 and the latter with 18 feet water on it.

Keating Island, lying close to the south side of Governor Island is 400 yards east and west, by 100 yards in width. Two dry rocks lie 100 yards east-southeast from the east end of Keating Island, and a bank with 12 feet water on it extends nearly 440 yards southeast from the south side of the island to a depth of 15 feet.

The ship's track passes between this bank and a shoal spit from Minnicoganashene Island.

Buoy.—A black spar buoy marks the south edge of the channel abreast of the middle of Smooth Island.

Minnicog Beacon stands on a small rock on the east side of the south entrance to Minnicog Channel. It consists of a slatwork pyramid painted white, which is nearly $1\frac{1}{4}$ miles 320° (NW. by N.) from Brebeuf Island Range Light. A shallow spit makes out 150 yards southwestward from the beacon and no channel exists among the rocks composing the string stretching nearly 1,320 yards south-eastward to Beausoleil Island.

Skylark Rock, about 4 feet high, lies just north of Minnicog Beacon. It is about 150 yards long northwest by 75 yards broad, and is the northwesternmost of the string extending from Beausoleil Island toward Smooth Island.

A bar over which not more than 11 feet can be carried (in low stages there may be 2 feet less) extends from Skylark Rock to Smooth Island, which should not be crossed by a stranger.

Beacons.—Two white beacons on Minnicoganashene Island in range 2° (N. $\frac{1}{2}$ E.) lead over the deepest part of the bar.

Buoy.—Two red and one black spar buoys mark the channel west of Minnicoganashene Beacon.

A narrow channel exists between Minnicog Beacon and Skylark Rock, with least water 9 feet. This passage is often used by small tugs running to Muskoka Mills or Muskosh, with a doubtful saving of distance. As the passage is so shallow, and the channel very little used, no detailed description will be given; the track is shown on the chart. A string of rocks joins Skylark Rock to the southeast part of Minnicoganashene Island, and did traffic warrant the placing of buoys a passage could be had through them.

Directions—Townsend Island to Minnicog Beacon.—Pass midway between Townsend and Newton Islands and about 100 yards from the two islands southeast of the former. Pass 50 yards from Cognashene Point and Cupid Island, and as soon as possible bring the island next northwest of Cognashene Point just open northeast of Cupid Island, bearing 313° (NW. $\frac{1}{2}$ N.) to pass through the narrow channel opposite Birchall Island. When past the latter,

gradually haul southward to pass close to Muskoka landing wharf, and keep the eastern coast of Maxwell Island close on board. Keep in mid channel opposite Long Point Island, pass 100 yards from the dry rocks on the northeast coast of Kindersley Island gradually turning the vessel's head for Hotchkiss Rock.

Pass 150 yards northeast and southeast of Gull Rock, and steer southwestward to pass midway between Minnicoganashene and Governor Islands. When nearing the southwest point of the former, avoid its spit by keeping the whole of McLeod Island open west of Minnicoganashene Island bearing 32° (NE. $\frac{1}{2}$ N.) and after rounding the spit keep the latter island on board, particularly near Alice Rock.

When southeastward of the islet close to Minnicoganashene Island, gradually haul southward, with the beacons on the latter in range astern, bearing 2° (N. $\frac{1}{2}$ E.) to pass between Skylark Rock and Smooth Island. These directions are given to supplement local knowledge, and it is hoped that with these and the chart the master of a light-draft vessel may be able to avail himself of the shelter from Midland to Point au Baril by the inside channel.

The Whalesback, a bare rock 10 feet high, 100 yards long and quite narrow, having steep sides and a round top supposed to resemble the back of a whale, is situated 590 yards southwestward from Ava Island and is the most northerly of a group of islands and rocks forming the southwest side of Whalesback Channel. The group has an average width of 200 yards, the northeast side having very deep water close to it. The Whalesback itself has deep water all round it and may be approached to 10 yards; the southwest side of the group not being likely to be required for navigation, no detailed survey was made thereof.

Beacon.—On the Whalesback is erected a tall pyramidal beacon painted white, to mark the entrance to Whalesback Channel.

Whalesback Channel, $1\frac{1}{4}$ miles in length, is the stretch from the Whalesback to Gull Rock; shoal water was reported in the middle of this channel, but, with the exception of a rock with 3 fathoms on it located between the Whalesback and Kindersley Island; after a careful survey no shoal water under 3 fathoms was discovered.

The obstructions to navigation between Smooth Island and Giant's Tomb Island are as follows:

A rock with 16 feet water on it, is situated on the range nearly 1,320 yards west-southwest from the Whalesback Beacon. Another spot with 18 feet least water on it lies 100 yards southeastward from the last. A rock with 11 feet water on it lies 880 yards southwest by south from the beacon, but being 590 yards southeast from the track is not very important.

Myrtie Bank is situated with its shoalest part, awash, 1,320 yards southwestward from the beacon. This spot is near the northeastern

corner of the bank, and from it the bank extends westward nearly 440 yards to 16 feet of water, southward 300 yards to 12 feet, and southeastward 200 yards to 7 feet. The northwestern part of the bank, with 16 feet of water on it, approaches the range to within 200 yards.

A rock with 18 feet least water on it lies on the range, 1.1 miles west southwestward from Whalesback Beacon.

Boucher Rock, with only 4 feet water on it, is a very dangerous rock lying only 200 yards northwestward of the range and west-southwest 1.1 miles from the Whalesback. Another rock with only 7 feet of water on it lies 140 yards east-northeast from Boucher Rock. The ground northwestward of this is all foul, there being no passage that can be described or recommended without buoys.

Fraser Bank, extensive and shallow, is nearly pear shaped with stalk toward the north; it is $1\frac{1}{2}$ miles long and 1,175 yards in greatest width, and its northern end with depth of 6 feet is situated 1.1 miles southwest by west from the Whalesback.

Bakewell Rock, with 10 feet water on it, lies 200 yards southeastward of the range and $1\frac{3}{4}$ miles southwest by west from the Whalesback; the rock is small and really only an outlying one from Fraser Bank, to which it is joined.

Indian Belle Rock is a very important danger for vessels bound either to Muskoka mills or to the southeast; it is 2.3 miles, 76° (E. $\frac{1}{2}$ N.), from Giants Tomb Island Lighthouse and 2.3 miles, 222° (SW. $\frac{3}{4}$ W.), from the Whalesback. It lies also 1,320 yards from Minos Bank, with 10 fathoms of water between them.

A bank with 16 feet of water on it, 300 yards long in a north-northwest direction and narrow, lies 350 yards northwest by north from Indian Belle Rock.

Clearing marks.—The southern extremity of Beausoleil Island touching Adams Point, bearing 132° (SE. $\frac{3}{4}$ S.), leads southwest from Indian Belle Rock.

The northeastern extremities of Southeast Wooded Pine and Giants Tomb Islands in range, bearing 338° (N. by W. $\frac{3}{4}$ W.), leads close west of the same.

Between Indian Belle Rock and Giants Tomb Island, the depth ranges from 7 to 10 fathoms.

Minos Bank is nearly elliptical in shape, the longest diameter being nearly 1 mile and the shortest 880 yards in length. The bank has four spots with less than 6 feet over them, the southern of which, and therefore nearest the main channel, lying $1\frac{3}{4}$ miles northward from Adams Point and lying 3.9 miles, 86° (E. $\frac{1}{4}$ S.), from Giants Tomb Island Lighthouse.

There are no dangers between this bank and Sawlog and Adams Points, although the bottom is uneven.

Mohawk Rock, with 8 feet water on it, lies a little over 880 yards west by south from Minnicog Beacon and is the central one of a string of small rocks lying south of Smooth Island, extending in a northwesterly direction nearly 880 yards; the southeastern end of the string has 10 feet of water and the northwestern extremity 15 feet of water on it; the track to Minnicog Channel is less than 440 yards east of the eastern rock.

Directions Bennett Bank to Whalesback Channel.—From a point 880 yards, 165° (S. $\frac{1}{4}$ E.), from Giants Tomb Island Lighthouse the beacons on Ava and Wabeck Islands in range, bearing 53° (N. E. by E. $\frac{1}{4}$ E.), lead clear of all dangers less than 3 fathoms.

The islands and dangers between Aberdeen and Giants Tomb Islands render this area unfit for navigation by any but those in light-draft vessels with local knowledge, except for a channel just northward and eastward of the northern end of Giants Tomb Island. See track on H. O. Chart No. 1864.

Shore.—From abreast Townsend and Newton Islands, the shore trends northward for $3\frac{1}{4}$ miles to Bushby Point, then northwestward for about $5\frac{1}{4}$ miles to Big Davids Bay. It is very irregular and foul, islands and other dangers extending on an average of 3 miles from it. The 17-fathom curve follows the general outline of the shore at about 6 miles.

The inner islands and dangers fronting the western side of the inside track along this section of the shores will now be described.

Newton Islands, the most northerly of the group, lie 150 yards southwestward from Townsend Island. They are quite steep-to next the channel and are small, with a few bushes on them. A small dry rock $\frac{1}{4}$ foot high lies 250 yards southeastward from the nearest part of Newton Islands; it lies close to the track, but is quite steep-to. From it the line of small dry docks trends in a general south-southeasterly direction 880 yards, widening the channel considerably, and then turns east-southeastward 440 yards to Cupid Island.

Beacon.—A wooden slatwork triangular beacon painted white is erected on the easterly Newton Island.

Barnard Bank has 4 feet water on its northern end, situated a little more than half a mile northwest from Townsend Island. The bank is narrow and 250 yards long in a north-northwesterly direction, with 6 feet of water on its southern end. The shoalest part of Barnard Bank is only 150 yards southwestward from the nearest part of Monkhouse Bank, and the track lies between them.

A small dry rock 1 foot high lies nearly 590 yards northwestward from Townsend Island, and on the southwestern side of the track; its northeastern side is steep-to, but shoal water extends 75 yards from its southwestern side.

A small shoal, with only 1 foot water on it, lies 250 yards west by north from Townsend Island, and a shoal with 2 feet lies a little more than 440 yards westward from the nearest part of the same island, but not being near the track, it is of no great importance.

Monkhouse Bank, with 6 feet of water near its northeastern extremity, lies $1\frac{1}{4}$ miles southeastward from Red Rock. The bank is nearly 440 yards in length, and its southwestern end with depth of 15 feet is close to the ship's track.

Several shoals lie northeastward of Monkhouse Bank and some distance off the shore line of dry rocks, but as they are far removed from the track no special mention will be made of them.

The only other shoal on the east side of the channel between Monkhouse Bank and Townsend Island is a small rock with 12 feet least water on it, lying 350 yards northwestward from the northwestern end of Townsend Island.

Judd Bank, with 3 feet least water on it, lies with its shoalest part distant over 590 yards southeastward from Mather Rock. From this shallow spot the bank extends northward 150 yards to a depth of 10 feet and 300 yards south-southeastward to a depth of 14 feet. This bank lies nearly 440 yards southwestward of the track.

A rock awash lies nearly 1 mile south-southeastward from Mather Rock and 440 yards southwest of the track; shoal water surrounds it at 100 yards in all directions.

Mather Rock, 9 feet high and 100 yards in diameter, is situated 1,175 yards southward from Red Rock. Dry rocks lie 200 yards southwestward, the same distance northwestward, 400 yards northeastward, and 100 yards eastward, respectively, from Mather Rock.

A rock awash lies 590 yards north by east from Mather Rock, and a spit with 11 feet of water on it extends 100 yards still farther in the same direction.

A rock awash lies 350 yards east-northeast from Mather Rock. It borders the inside channel and is steep-to on its northeast side, but a reef with 8 feet of water on it extends 150 yards southeast from it and parallel to the ship's track 150 yards distant.

A rock with less than 6 feet of water on it lies 200 yards southeastward from Mather Rock. The end of the whole bank with 7 feet water on it lies 100 yards southwestward from this shoal. The bank from Mather Rock runs thence 590 yards northwestward, where a depth of 5 feet will be found.

Some other dry rocks lie westward of Mather Rock, but as all the ground about them is foul and unfit for vessels unless carefully buoyed they will not be described.

Donald Rock, about 5 feet high, small and clean all round, lies 880 yards 350° (N. $\frac{1}{4}$ W.) from Mather Rock. Just separated from

the north end of a bank extending from Mather Rock is a small rock $\frac{1}{2}$ foot high, lying 100 yards south-southeast from Donald Rock.

Although not close to the track, two small rocks 4 feet high lie westward 440 and 590 yards, respectively, from Donald Rock.

Valentine Rocks, three in number, and 5 feet high, are situated nearly 1 mile south-southeastward from Split Rock, and the string extends 250 yards in a south by west direction. Only 9 feet water will be found 150 yards northeast and 200 yards east from the north part of Valentine Rocks, the ship's track passing 100 yards northeastward from these spots. The bank, too, has only 7 feet water on it 200 yards eastward from the south end of the group, while shallow water extends 250 yards southward.

Buoy.—A black spar buoy marks the extremity of the shoal water to the northeastward of Valentine Rocks.

Bolster Bank is a long narrow bank with its northwestern end, with 12 feet water on it, situated rather less than 880 yards west, and its southeastern end, with 18 feet on it, over 880 yards south from the southern end of Split Rock. One shoal spot, with only 2 feet of water on it, lies a little southeastward from the northwestern end. Another, with the same depth, lies 590 yards southwestward from Split Rock. The ship's track passes over a couple of spurs on the northeastern side of Bolster Bank; so that in going through this part of the inside channel only 14 feet water can be counted upon (in low stages there may be 2 feet less) and the track is crooked.

Buoy.—A black spar buoy is moored off the northwest shoal spar near the southern edge of channel.

Eastward of Split Rock Group is a large bay rendered useless by shoals and dry rocks.

Superior Shoal, with 5 feet water on it, is situated 250 yards west-southwestward from Delf Island. The shallow head is surrounded on all sides by only slightly deeper water for a distance of 50 yards. The ship's track is 75 yards northeastward of Superior Shoal.

Buoy.—A black spar buoy is moored on the east side of Superior Shoal.

Single Rock, 7 feet high, is very small and situated 590 yards westward from the northwestern point of Delf Island. Except for a spit that makes out in a northeasterly direction 50 yards to a depth of 9 feet, it has deep water all around it.

The bay behind Teat Rocks and Morris Island is from 440 to 880 yards deep, and the bottom is lumpy, necessitating great caution in its use. The eastern shore of this bay and of the channel as far as Delf Island is broken up into innumerable islands and rocks for some distance. All the islands are wooded with stunted pines and pop-

lars, and at a short distance no break in the continuity of the shore can be discerned.

Gibson Reef.—The northern point of this reef, awash, lies 350 yards south-southwestward from Kerr Island, and the reef extends thence nearly 440 yards southwestward, with a width of about 200 yards; on it are several small dry rocks, the highest (7 feet) being the most southerly of the group southwestward of The Teat.

The Triplets, a group of three small rocks 3 feet high, lying nearly 440 yards west-southwest from Kerr Island, are steep-to.

Allen Rocks form a group 1,175 yards long, east and west, by 590 yards in greatest breadth, the most easterly rock, 2 feet high and bold-to, being situated 300 yards southeast from The Teat. The northern island of the group, 11 feet high, situated 440 yards west by south from the same, may be recognized by a single poplar tree (1893). The track is midway between these rocks and The Teat.

Addington Bank, over 590 yards long in a west-southwest direction, with an average width of 150 yards, has two dry rocks on it; one, 2 feet high situated at the southeastern corner 440 yards southwest by west from Spray Rock, and having shoal water extending northwestward 300 yards. The other, 1 foot high near the middle of the bank, distant nearly 880 yards west by south from the same, has shoal water extending from it 300 yards farther in the same direction.

Digby Bank, awash, lies nearly 1,175 yards southwest by west from Cuddy Island, and from this shoal spot the bank trends northwestward 100 yards to a depth of 13 feet and south-southeastward 200 yards to 12 feet. Between this and the bank above mentioned are two small shoals with depths of 15 feet, and the track is between them.

East by south 250 yards from the rock awash is a shoal with 7 feet only on it and 100 yards southwest of the track. From Digby Bank a string of shoals, with 13 to 16 feet water on them, extends 1,320 yards northwestward, the outer spot of 13 feet lying 880 yards southwest from American Camp Island.

Hervey Rock, with 5 feet least water on it, is situated 590 yards westward from the shoalest part of Digby Bank, and to the depth of 12 feet extends west 100 yards. One-fourth of a mile north-northwest from Hervey Rock is a small shoal with 13 feet water on it.

The islands, dangers, and obstructions on the eastern side of the channel will now be described.

Townsend Island, 22 feet high and nearly bare, is rendered conspicuous by the long, bare, rocky slope on the west side very bright when the sun shines upon it. The island lies 1,320 yards 324° (NNW. $\frac{1}{2}$ W.) from Cognashene Point, is irregular in shape, nearly 440 yards long in an east-northeasterly direction and 300 yards wide along its southwest side, which is quite steep-to.

Warwick Rocks form the most southerly of the rocks lying between the ship's track and Bushby Point. There are four rocks closely connected in the group, which is 300 yards in diameter and 10 feet high. The most southerly one of the group lies rather over 1,320 yards southeast from Red Rock. Shoal water extends southwestward 200 yards to a depth of 5 feet from the southern Warwick Rock.

A small shoal with 12 feet least water on it lies 590 yards west by south from the southern Warwick Rock.

A rock with 18 feet least water on it lies 440 yards south-southwest from the southern Warwick Rock.

There is possibly good anchorage south of Bushby Point Bluff, but as the shelter is not good and the place of doubtful utility, no close examination was made of it and care must therefore be exercised in using it.

Rickcord Rocks, three in number and lying close together, are situated a little over 590 yards southeast from Red Rock. Between Rickcord and Woore Rocks is another group 7 feet high, but there is no safe passage anywhere eastward of Red Rock.

A rock with 4 feet of water on it lies 250 yards westward from the nearest part of Rickcord Rocks. As this is only 100 yards from the ship's track, caution is necessary. A spit with 15 feet water on it makes out 200 yards south-southeast from this shallow rock.

Red Rock, 11 feet high and small, is situated 1,175 yards southwestward from Bushby Point. The moss on it gives it a reddish or orange color, hence the name. It is steep-to on its south and west sides, but northward are dry rocks and shoal water for a distance of 300 yards, where there is a depth of 9 feet. The track into Bushby Inlet is 100 yards north of this 9-foot spot, and the ship's track is 125 yards southwestward of Red Rock.

Beacon.—On the summit of Red Rock is a beacon painted white.

Southeastward 200 yards from Red Rock is a small rock which is steep-to on its south and southwest sides.

Campion Island, 15 feet high, is situated 1 mile southeastward from Bushby Point. The north side is thickly wooded and the south side being higher and bare, renders the island distinguishable from the rest of the shore at 2 miles distant.

Bushby Point, the southeast entrance point of Bushby Inlet is situated $1\frac{1}{4}$ miles southeastward from Split Rock and 150 yards eastward from Foreman Islands, the track into Bushby Inlet passing 100 yards northwest from the point.

Bushby Point Bluff, 56 feet high, is situated 440 yards eastward from the point and is the only feature on the whole shore that can be recognized beyond 2 miles. Its height, shape, and some dark trees make it distinctly discernible at 5 miles.

Bushby Inlet is an inlet northeast of Bushby Point, which bears 26° (NE. by N.) and is distant in an air line $3\frac{3}{4}$ miles from the north end of Giants Tomb Island. Bushby Inlet is hardly a harbor for a stranger to enter, but with a few bush buoys 18 feet was easily carried in by the surveying steamer *Bayfield* in 1893. Into it empties one mouth of Go Home River, and at one time logs were rafted here and towed to the sawmill. At present very little logging is done in the inlet, the mouth of the river being dammed across and the logs floated to Muskoka Mills.

Anchorage.—The best anchorage in the inlet is found about 1 mile in from Bushby Point, but the channel leading to it is very narrow. After passing Bushby Point the mainland southeast shore must be kept very close on board, often not 10 yards distant. Not less than 21 feet will be found till crossing the bar into the anchorage. The *Bayfield* used also to anchor in $4\frac{1}{2}$ fathoms, nearly 1,320 yards north by east from Bushby Point for convenience of the survey, but the entrance to this anchorage is crooked and narrow and not recommended to strangers.

From Bushby Point the broken-up shore trends in a general easterly direction 1 mile, then turns and runs $2\frac{1}{4}$ miles south by west to Townsend Island.

Woore Rocks, six in number, lie close southward from Foreman Islands and of the track into Bushby Inlet. They are connected by a shallow bank to Bushby Point, distant 200 yards; but as they are steep-to on the northwest side, they may be kept very close on board when entering the inlet.

Beacon.—On the southwestern of those rocks is erected a beacon painted white, which in range with that of Felix Rock bearing 123° (SE. $\frac{1}{2}$ E.) leads between Split Rock Bank and Bolster Bank.

Foreman Islands, 19 feet high, are a group lying nearly 880 yards eastward of Felix Rock, and the track into Bushby Inlet is south of them. A spit makes off nearly 440 yards southwest from the highest Foreman Island, where the depth is but 2 feet. A bank 200 yards long in a north-northwest direction, with 10 feet water on it, lies with its northwestern and shoalest part 590 yards west by south from the highest Foreman Island, and the track into Bushby Inlet passes close south of it.

Felix Rock is the outer of a long string of rocks and islands lying in the mouth of Bushby Inlet, and over 590 yards south of Cecil Island; it is small, about 4 feet high, with deep water all around it.

Beacon.—On the rock next eastward of Felix Rock is erected a beacon painted white, which in range with a similar one on Woore Rocks, bearing 123° (SE. $\frac{1}{2}$ E.), leads between Split Rock Bank and Bolster Bank.

A rock awash lies 100 yards southward from Felix Rock, and a shoal with 10 feet water on it lies 250 yards northward from the same.

Cecil Island, 15 feet high, is situated over 1,320 yards southeast from Split Rock, the island with a few shrubs upon it being 250 yards long north and south by 50 yards in width. Some dry rocks extend nearly 440 yards north-northwest, a few small rocks lie detached from the southwest side, and a shoal bank extends 200 yards from the west side. A small rock, with 13 feet water on it, lies 250 yards west from the northern rock of Cecil Island. The latter lies 440 yards from the west coast of a large island lying in the mouth of Bushby Inlet, but as it is not near the track nor has any conspicuous feature, it will not be described in detail.

Split Rock is situated 880 yards southeastward from Delf Island. It is really only a small rock, but the term applies to the whole of the group of islands and rocks, of which it is the southern termination. Shoal water runs off Split Rock a long distance, making the ship's track in this locality very dangerous.

South-southwestward 440 yards from Split Rock will be found a spot with 9 feet water on it, which is only 50 yards from the track. One-third of a mile south by east from the same is a spot with 10 feet water on it, 75 yards from the track.

Clearing mark.—The south side of Campion Island over, or slightly open, northeast of the rock next east of Felix Rock bearing 123° (SE. $\frac{1}{2}$ E.), leads southwest of these shoal spots.

West by north 300 yards from the south end of Split Rock is a small dry rock with a shallow spit extending from it, 150 yards south-southwest where will be found a small spot having on it 8 feet of water. The track is only 75 yards southwestward from this.

Delf Island, 13 feet high, with a few bushes on it, is situated over 590 yards south by east from Morris Island; it is 200 yards long in a northwest direction by 100 yards in width. Shoal water extends 200 yards south by west from its south end to 11 feet, and 100 yards west of the island to less than 6 feet; between Morris and Delf Islands, shoal water fringes the line of rocks westward for an average distance of 200 yards.

Beacon.—A wooden slatwork triangular beacon painted white is erected on the northwestern point of Delf Island.

Morris Island, 9 feet high, flat and treeless, is the outer of a large group, its west end being situated 1 mile south-southeast from Kerr Island. It is about 200 yards in diameter; shoal water extends westerly from it 200 yards to a depth of 14 feet, and to within 100 yards of the ship's track. Nearly 590 yards north-northwest from the west

end of Morris Island is a small outlying rock with 11 feet water on it, which is a short distance eastward of the track.

Nicholson Spit with 6 feet water near its outer end, is the termination of a chain of dry and sunken rocks extending westward from the shore. The outer end of the spit lies 590 yards southeast by south from Kerr Island, and the ship's track is 150 yards westward from this spit.

Kerr Island, 75 yards in diameter, treeless, and 14 feet high, is situated 590 yards south-southeastward from The Teat. It has good water close to it, but is only separated by a deep gully 6 fathoms deep, from a very bad shoal with 9 feet water on it laying 75 yards southwest of the island, and to avoid this danger vessels should keep the island close on board.

Beacons.—On Kerr Island are erected two white beacons, which in range bearing 340° (N. by W. $\frac{1}{2}$ W.) lead west of Nicholson Spit and all shoals to Delf Island.

The Teat, 17 feet high, lies 200 yards southeast from the highest rock, and is connected thereto by the other two dry rocks. All four may be approached to 25 yards.

Between One Tree Island and Teat Rocks, the mainland, which is only 440 yards back, is fringed with shallow water for a distance of 200 yards.

Teat Rocks, so called from the shape of the southeastern one, are four in number, situated with the northwestern largest and highest (20 feet), 440 yards east-southeast from Spray Rock.

Spray Rock, 6 feet high, is situated 440 yards southward from One Tree Island, and being steep-to on its west side every little sea causes the spray to fly over it, and thus its name. It forms the southwestern corner of a triangularly shaped bank, the northern corner with 7 feet being 250 yards northward and the east corner with 9 feet water 350 yards eastward from Spray Rock; the ship's track passes 100 yards southwest of the latter.

One Tree Island, 22 feet high, and easily recognized in the vicinity by its single tree with a very dark top (1893), is situated 590 yards south-southeast from Ottley Island. It is 200 yards long northwest and southeast by 150 yards wide, and like most of the islands is only the outer of a string often extending a long distance from the mainland. One Tree Island marks the southern entrance of a narrow boat channel called Indian Harbor, through which small tugs and boats can carry 6 feet.

The northern entrance to Indian Harbor is 300 yards south of Black Rock, and on its shores are erected several summer cottages.

Shoal water extends 100 yards southwest from the southwest point of One Tree Island and 200 yards northwest from the north point of

the same. One-quarter of a mile northwest from the island is a small rock 3 feet high, with fairly deep water round it.

Ottley Island forms the southeast entrance point of Big Davids Bay; it is about 100 yards square, and is situated nearly 1,320 yards southeast from American Camp Island and the same distance south-southwest from Black Rock. It is 16 feet high, has a few bushes on it, and is joined by a string of dry rocks to the shore, distant nearly 440 yards. The west side of the island is clean, but from its northern end a reef of dry and sunken rocks extends northward over 440 yards, where there is a depth of only 5 feet. Boats of light draft pass close, but those of heavier draft keep 590 yards west from Ottley Island.

Nearly 300 yards northwest from the latter is a very small low dry rock, whence a spit extends north-northeast 100 yards, where 10 feet will be found. West-northwest 440 yards from Ottley Island is an other spot on the same bank, with only 5 feet water on it. West-southwest a little over 590 yards are two small dry rocks $\frac{1}{2}$ foot and 2 feet high, and from the latter shoal water extends north-northwest 150 yards to a depth of 11 feet. These three small dry rocks are joined by shallow water, forming a bank 880 yards long north-northeast and south-southwest.

Directions Townsend Island to Big Davids Bay.—From the middle of the entrance to Muskoka Landing Channel steer to pass 100 yards northward of the rock 1 foot high lying 590 yards north-westward of the entrance, then with the gap in the bluff on Beausoleil Island over the southwest side of Townsend Island astern steer about 328° (NNW. $\frac{1}{4}$ W.) to pass 70 yards westward of Red Rock Beacon. From abreast this beacon steer 345° (N. $\frac{3}{4}$ W.) until nearly abreast the buoy moored northward of Valentine Rocks, when change course to westward, passing close northward of the buoy; when the southern extremity of Cecil Island is abeam steer 304° (NW. $\frac{3}{8}$ W.) until Bolster Rocks are on the port beam, when haul gradually to northward, passing between Superior Shoal and Delf Island to westward of Morris Island and Nicholson Spit, then haul gradually to westward, passing northward of Gibson Reef and close southwest of Kerr Island, then slightly to northward to pass in mid-channel between Allen and Teat Rocks, keeping 100 yards from East Allan Rock, when steer 303° (NW. $\frac{3}{8}$ W.), passing about 125 yards southwest of Spray Rock and 150 yards northeast of the rock awash on Digby Spit, then haul gradually northward, passing at a least distance of 300 yards southwest of the dry rocks westward of Ottley Island into Big Davids Bay.

These directions supplement the tracks shown on the chart. Mariners without local knowledge should obtain a pilot.

The outer islands and dangers from Giants Tomb Island to Big Davids Bay are:

Turtle Rock, 10 feet high, 125 yards long and 75 yards wide, east by south, is 880 yards from the northeastern end of Giants Tomb Island and surrounded by shoal water.

Eshpabekong Island is a large, almost bare island lying about midway between the Giants Tomb and Townsend Islands. The main island has a few bushes on it, and is 31 feet high, but is only one of a long string, the northwestern islet of which lies $1\frac{1}{4}$ miles east by north from the northeastern end of Giants Tomb Island. From this islet the string runs southeastward $1\frac{1}{4}$ miles, being 150 yards wide at the widest part. Lying in a large gap between the northeastern shore and Giants Tomb Island, Eshpabekong Island is a conspicuous object, but otherwise unimportant, as no vessel can approach to within 1,175 yards of it without a number of buoys or ranges. No passage was discovered between Turtle Rock and Eshpabekong Island, nor between the latter and the northeast shore.

Directions between Giants Tomb Island and Turtle Rock.—With the assistance of three buoys and two pair of beacons, the surveying steamer *Bayfield* frequently used to pass between Giants Tomb Island and Turtle Rock with not less than 12 feet on a bar connecting them.

Alfred Bank.—The southern and shoalest part of this bank, with depth of 9 feet, lies 1,320 yards north by east from the same point; the bank trending 250 yards northwestward to a depth of 18 feet, with a width of 150 yards.

Both Alfred and Hopkins Banks lie just westward of a much larger and shoaler bank of very irregular shape.

Hopkins Bank, three cornered, with shallowest part of 13 feet in the middle, lies 1.1 miles north from the northeast point of Giants Tomb Island; a rock with depth of 16 feet is situated a little less than 1 mile northward from the same point.

Roe Rock, 1 foot high, lies $1\frac{1}{4}$ miles northward from the northeast point of Giants Tomb Island. It is very small and has no shallow water immediately connected with it. A bank lies 150 yards southwest from Roe Rock; it is 440 yards long east and west and 200 yards wide, the shallowest part, 8 feet, being on the east, while a depth of 14 feet will be found on the other end.

Grace Bank has 6 feet on its northeast end, situated southeast by south $1\frac{1}{4}$ miles from the southeast and nearest rock of Pine Islands.

Fawkes Rock is dry and small, lying 880 yards southward of Grieve Rock, and has rocks awash extending 440 yards northward from it. The outer shoal, with 18 feet, lies a little more than 440 yards westward, and shoals under that depth extend the same dis-

tance southward from Fawkes Rock. When in this vicinity, vessels should not proceed farther northeast than to have Adams Point in range with the Gap of Giants Tomb Island bearing 141° (SSE. $\frac{1}{4}$ E.).

On account of the distance of Adams Point, the extremity may not always be discernible, in which case a vessel using the passage between The Watchers and Pines will find as good water by keeping the northeast fall of Adams Point Bluff in the hollow of the trees on the main part of Giants Tomb Island on nearly the same bearing, which leads 590 yards farther southwestward. The first mark leads 250 yards southwest from Anchor Rock and 590 yards on the same direction from Bolger Rock; the latter leads 590 yards farther from these dangers, but only 150 yards northeast of or inside Spain Rock.

A bank, with 12 feet least water near its middle, lies 440 yards south-southwest from the southeastern dry rocks of The Pines.

Relatively to the southeast dry rock of The Pines lie the following shoal spots with their depths, magnetic bearings, and distances:

A bank, with 12 feet 167° (S. $\frac{1}{4}$ E.), 880 yards; a rock, with 17 feet 206° (SW. by S.), the same distance; a patch of same depth 178° (S. $\frac{1}{4}$ W.) 1,175 yards; a rock, with 15 feet 164° (S. $\frac{1}{4}$ E.) 1 mile and one with 18 feet water $1\frac{1}{4}$ miles 162° (S. by E.).

Southwestward of this string of sunken rocks are many others, on none of which was found less water than 21 feet, but it is again recommended to use all caution in this locality.

Anchor Rock with 11 feet, lies 1,320 yards westward from Grieve Rock, it being 150 yards long in a north-northwest direction.

Grieve Rock, 5 feet high and small, has shallow water extending from it a long distance, and lies 1,320 yards northwestward from the northern end of Gray Island. Depths under 10 feet extend west-southwestward 440 yards; under 7 feet northwest by north, 200 yards; under 6 feet east-northeast nearly 440 yards and less than 12 feet southeast by south 1,175 yards from Grieve Rock. A bank, with 17 feet, lies 1,175 yards northwest by west from the same. Westward 590 yards from Grieve Rock 10 feet will be found, being the middle and shoalest part of a bank 590 yards long in a north-northwest direction and 100 yards wide, with 15 feet of water at the ends.

Gray Island, 39 feet high, 440 yards long in a northwesterly direction, and 250 yards wide, lies 880 yards southwestward from Southeast Wooded Pine Island, and $2\frac{1}{4}$ miles east-northeast from North Watcher Island. The island, as its name indicates, is of a gray tint, and has only a few small bushes on it. It is one of a string of dry rocks extending 250 yards northwest from its northwest point, and 590 yards southeast from its southeast point, the last

being the southeastern of Pine Islands, and bearing north-northwest $3\frac{1}{2}$ miles from the nearest part of Giant's Tomb Island.

From the southeastern rock a bank makes out southeastward 1,175 yards to a spot with less than 6 feet of water on it, then forks out, one spit going 880 yards southeastward where will be found less than 6 feet, and the other 590 yards southwestward to a depth of 15 feet. No vessel can pass through between these spits and Giant's Tomb Island without buoys and frequent changes of course. The whole ground northeast of a line joining Gray and Giant's Tomb Islands is full of shoal water and totally unfit for navigation.

A rock, 7 feet high and small with very little shallow water lying off it, lies 1,175 yards southwest by west from Table Rocks.

Southeast Wooded Pine Island is about 30 feet high, and on account of its trees is the most conspicuous island in the group. The island is nearly elliptical in shape, 350 yards long in a northwest direction by 150 yards wide. It lies 1,175 yards southeast from Table Rocks and 257° (W. $\frac{1}{4}$ S.), distant $1\frac{1}{2}$ miles from Delf Island.

Northwest 200 yards from Southeast Wooded Pine Island is a dry rock, about 100 yards square, lying on the bank joining Table Rocks and Southeast Wooded Pine Island.

Stretching southeastward over $\frac{1}{4}$ mile from Southeast Wooded Pine Island are three dry rocks; but as they are less than 12 feet high and not conspicuous, they are unimportant to the general navigation. Shoal water extends nearly $\frac{1}{4}$ mile southeast and 1,175 yards southward from the southeast rock just alluded to.

Table Rocks, 21 feet high, so called from the flat appearance of the highest one, are comprised in a group about 300 yards in diameter, none being over 75 yards across, which lie 1,320 yards southeast from Gilead Rock. Shoal water and small dry rocks connect this group with Gilead Rock and Southeast Wooded Pine Island.

West-northwest 440 yards from Table Rocks is a rock about 100 yards in diameter and 15 feet high. It has a few small dry rocks stretching off 100 yards northeastward, and shoal water connects it with Table Rocks and Gilead Rock.

Spencer Reef.—The small rock $\frac{1}{4}$ foot high in the middle of this reef lies 1,320 yards west by south from Gilead Rock. The reef extends 590 yards northward to 13 feet, with only 5 feet close to it, and nearly 440 yards southeast, where there is a depth of 10 feet. The reef has an average width of 200 yards and is generally very shoal.

A rock having 16 feet least water on it lies 700 yards west-northwest from the dry rock on Spencer Reef. Another with 14 feet water on it lies north-northwest nearly 1,175 yards from the same rock, and the two are connected by slightly deeper water.

Gilead Rock, 13 feet high, lies 150 yards southeast from the south-east end of North Wooded Pine Island. It is 200 yards long north and south by 100 yards wide. A very shallow spit makes out in a southerly direction 440 yards from Gilead Rock, and a shallow bank with some dry rocks on it joins it to Table Rocks.

Pine Islands are a large group of islands and rocks lying from $1\frac{1}{2}$ to 2 miles from the islands and dry rocks constituting the north-east shore of Georgian Bay. Only two of the islands have trees on them, although several more have a few small bushes. Situated so far from the shore, one would expect to be able to distinguish them from a long distance seaward, but on account of their small height and bareness they only show up when comparatively close in.

North Wooded Pine Island is 26 feet high but covered all over with pines that give it a much higher appearance. Its northwest point is situated 590 yards southeast from the southeast point of Northwest Pine Island, with which it is connected by shoal water. The island is nearly rectangular in shape, 590 yards long southeast and northwest, and 200 yards wide.

Bolger Rock, with 8 feet least water on it, is a small but serious danger in the approach to Big Davids Bay. It lies 1 mile 250° (WSW. $\frac{1}{2}$ W.) from the northwest extremity of Northwest Pine Island and 300 yards southeast of the track into Big Davids Bay.

A rock with 15 feet least water on it lies 1.4 miles southwest by west from the same point of Northwest Pine Island, and should be guarded against by vessels in the vicinity.

A rock with 14 feet on it lies 880 yards southward from the western dry rock west of Northwest Pine Island.

Northwest Pine Island is composed of two islands, the eastern one of which has a few small bushes on it. The two islands together are over 590 yards long northwest and southeast, 250 yards wide, 23 feet high, and are situated 2 miles southwestward from American Camp Island. Close off the northwest point is very deep water, but a bank makes out 250 yards from the northeast side of the island to a depth of 9 feet.

Between Northwest Pine Island and Hervey Rock are several shoal banks, but, as they lie considerably southeastward of the Big Davids Bay Track, no special mention will be made of them. Passages exist northeast of Pine Islands, but, as the numerous shoals are distributed in such an irregular fashion, the locality is extremely dangerous and unfit for use without buoys.

A dangerous shallow spit extends in a southerly direction 590 yards from Northwest Pine Island and a shallow bank connects it with North Wooded Pine Island.

Two rocks, 6 feet high, lie from 300 to 400 yards westward from Northwest Pine Island, and from them shallow water extends north-westward 200 yards and southeastward 590 yards.

A bank with 10 feet least water on it and 300 yards long north-west and southeast, lies with the latter and shallower extremity distant 440 yards northwest from Northwest Pine Island. The north-west end with 17 feet water over it is only 75 yards southeast of the range into Big Davids Bay.

Watcher Islands (The Watchers) are two small islands acting as a kind of guard to the shore, hence the name. The islands are North and South Watcher.

South Watcher Island, 100 yards long by 50 wide and 9 feet high, lies 1 mile 189° (S. by W. $\frac{1}{2}$ W.) from North Watcher Island. A few low bushes on it add very little to its height. Dry stones make out north 590 yards, and 200 yards westward, while a detached stone 9 feet high lies 250 yards east-southeast from the island.

The Watchers lie on one large shallow bank, which extends over 1,320 yards north-northeast from North Watcher Island, where will be found a depth of 13 feet over boulders; and 1,175 yards south by west from South Watcher Island, where will be found a depth of 17 feet with 11 feet 200 yards inside, rapidly shoaling to less than 6 feet. The bank midway between The Watchers is nearly 1 mile wide, and has less than 6 feet water at its western edge.

Watcher Reef is a large reef of boulders, some of which are just dry, lying 1 mile west-southwest from South Watcher Island. The reef makes out from the dry stones southwestward 200 yards to 17 feet, with 8 feet a short distance inside; northward 300 yards to a spot with less than 6 feet; northeastward nearly 880 yards to 16 feet; and 200 yards eastward to 15 feet water. Between this reef and the large bank of The Watchers just described is a lane of deeper water, but it is not recommended. Between the shoals bordering North Watcher and Pine Islands there is a passage 1,175 yards wide. The holding ground under The Watchers is poor.

North Watcher Island, the larger of the two and the more conspicuous, is easily recognized by the low bushes covering the whole island, and the large tree (1893) on its north end considerably overtopping the rest. The tree is 6 miles 55° (NE. by E. $\frac{1}{2}$ E.) from Hope Island Lighthouse. The tree is close to the north edge of the island, which is about 20 feet high and 150 yards long north and south by 100 yards wide. A reef of gravel and stones extends south-southeast nearly 440 yards, and the same distance south-southwest. Dry stones also lie 100 yards off the northwest side of the island, and a detached dry stone lies 300 yards eastward from the tree.

In thick weather or at night a vessel between The Watchers and Moose Point should not stand into less than 15 fathoms.

Spain Rock, with 11 feet least water on it, is a very important shoal lying a long way off shore, and having just enough water on it to bring up a large vessel with any sea on. It is 150 yards long north and south by 50 yards wide, and lies $2\frac{1}{4}$ miles 341° (N. by W.) from the tree on North Watcher Island. A small rock with 18 feet of water on it lies 400 yards southward from Spain Rock.

Between Spencer Reef and Spain Rock are several spots that appear shoal when passing over them, but a careful search could discover nothing dangerously shallow. At the same time great care must be taken when in less than 10 fathoms of water, as these rocks rise almost perpendicularly from the bottom and are extremely hard to find with the lead. While every care has been taken to discover the shoals, some, possibly, are omitted.

Big Davids Bay is composed of two parts connected by Miners Creek, the survey not extending to the northern part. The bay may be entered from the northwest or the south and fair anchorage with good shelter had either east of Shawanaga Island, west of Gillespie Island, or off the north entrance to Indian Harbor.

No. 9 Island, the largest of the group, 880 yards long north and south, by over 440 yards in width, lies about 1 mile 326° (N. N. W. $\frac{3}{4}$ W.) of Indian Harbor.

Buoys.—Two red spar buoys are moored 440 yards off the east side of No. 9 Island.

American Camp Island, low, flat, of considerable size, with a few pines on it, and the most southerly of Big Davids Bay Group, is situated a little over 590 yards southwest from No. 9 Island. Southwestward 300 yards from it is a reef 5 feet high, the southernmost of the group. Islands and rocks of various heights, shapes, and size occupy the space between No. 9 and American Camp Islands. Only 15 feet water will be found 440 yards eastward from the south point of American Camp Island.

Gillespie Island, small, 12 feet high and nearly bare, lies over 880 yards southeast from Wood Island. Shoal water extends northwest 200 yards, and islands and dry rocks nearly 440 yards southerly from Gillespie Island. The shore between the entrance of Miners Creek and Gillespie Island is nearly straight and may be approached to 50 yards, while southeast from the island the broken-up shore runs 1,175 yards to the entrance of a shallow unsurveyed bay.

Happygolucky Island is situated 880 yards south by east from Gillespie Island. The former is wooded and marked by a house painted white, used as part of a leading mark for entering Big

Davids Bay from the southwest, but as the island has not all been surveyed its size can not be given.

Black Rock, small and 10 feet high, lies 200 yards from the eastern shore and nearly 1,320 yards southward from Gillespie Island. During the survey in 1893 a temporary beacon on this rock in range with the house on Happygolucky Island, bearing 62° (E. by N. $\frac{1}{2}$ N.), led into the anchorage west of Black Rock.

Between a line joining Black Rock and Happygolucky Island on the east, and one joining No. 10 and No. 9 Islands on the west, a bar of dry rocks and dangerous shoals almost block the inside channel. The two beacons in King Bay in range should take a vessel across the bar with 11 feet, and this depth was carried through by the surveying steamer *Bayfield* in 1893.

Wahwahtaysee (Alexander) Island, situated 590 yards south-southwest from Wood Island, is conspicuous on account of its height and the summer houses erected thereon. It is only about 700 yards long by 100 yards wide and has a small wharf on its north side, which only boats of light draft can use.

Iron Rock, small, about 5 feet high with shoal water stretching eastward 150 yards, lies 200 yards east of Wahwahtaysee Island.

No. 10 Island is the next island near the channel and 880 yards southward from Wood Island. It is wooded, about 10 feet high, 225 yards long northwest, by 40 yards wide.

Buoy.—A black spar buoy is moored east of No. 10 Island.

Shawanaga Island, 16 feet high, rather larger than the average of the neighboring islands, and nearly bare, is 350 yards long in a northeast direction by 175 yards in greatest width, and its northeast end lies 200 yards southwest from Wood Island. A bank with depth of 7 feet and 200 yards long lies east-southeast from the northeast end of Shawanaga Island, being separated therefrom by a narrow channel, in using which the island must be kept close on board.

Wood Island, nearly $2\frac{1}{2}$ miles east-southeast from Gooseberry Island, is important as being the turning point of the inside channel. This island, the northeasternmost of the group sheltering Big Davids Bay, is nearly circular, 11 feet high, with only one small detached dry rock lying 40 yards from its northeast side. Shoal water extends 100 yards east, and 50 yards southwest from Wood Island, and the ship's track is north of it.

Geraldine Island, small, wooded, about 20 feet high, 225 yards long west-northwest, and 40 yards wide, lies nearly 880 yards east-southeast from Middle Rock, and the water on its north side is 10 fathoms deep.

King Point forms the west entrance point of King Bay, the northern inlet of Big Davids Bay, and in which there is good anchorage.

From the head of King Bay there is a portage of about $1\frac{1}{2}$ miles to Twelve Mile (Deep) Bay. East, rather over 880 yards from Wood Island, is the entrance to Miners Creek, a narrow channel connecting the north and south portions of Big Davids Bay.

Beacons.—On an islet 24 feet high in King Bay, situated 590 yards eastward from King Point, are erected two beacons painted white, which in range bearing 2° (N. $\frac{1}{4}$ E.) lead through the portion of the channel eastward of No. 9 Island.

Shore.—From King Point the shore trends northwesterly 4 miles to O'Donnell Point. It is irregular and fronted by shoals and foul ground throughout. The island and dangers fronting it are now described.

Ward Island, very small and wooded, and 15 miles east-southeast from Bourke Point, next claims attention, as the channel here is between it and Middle Rock and is only 100 yards wide, but fortunately the shores on each side are particularly steep to.

Between Tully and Ward Islands the bay is foul; the most dangerous rock having only 7 feet water over it, is situated 250 yards westward from the south point of Ward Island.

Between Bourke Point and Ward Island, the mainland is easily discernible at a distance of 50 to 440 yards from the line of the islands. Nowhere does it attain any height over 25 feet, and it is sparsely covered with pines, birch, and poplar of a small growth.

From Ward Island eastward the mainland forms the north shore of the channel, trending in a general easterly direction 880 yards to King Point. Deep water will be found off all this shore.

Middle Rock, round, smooth, and 10 feet high, lies in the middle of the inside channel and 300 yards eastward from Fairlie Island; the channel, 8 fathoms deep, is close to its north side.

The string of islands and rocks lining the south side of the inside channel eastward of Fairlie Island is quite clean, and as they are all small, without distinguishing features, will receive no special mention.

Tully Island is the most conspicuous island close to the channel, its west end being situated 1.1 miles east-southeast from Bourke Point. Like Niblett Island it is thickly wooded, but only about 10 feet high. It is likewise nearly oblong, 440 yards long east and west, with an average width of 100 yards. Lying nearly 100 yards southwest from the west point is a very shallow rock that must be guarded against.

Fairlie Island is a small wooded island lying over 1,320 yards east-southeast from Calvin Island and close to the southwest side of the inside channel. It is the most northerly of the large group of islands and rocks in the mouth of Big Davids Bay, and is joined

to a numerous string of islands and rocks trending southwestward and eastward. The round smooth rock, 100 yards west of Fairlie, is used in conjunction with the entrance to Miners Creek as the leading mark mentioned to lead south of Gooseberry Island.

The space between Calvin and Fairlie Islands is filled with low dry reefs and shoals, none of which, however, are close to the ship's track, which abreast of Fairlie Island has a depth of 10 fathoms.

Niblett Island, 30 feet high, lying close to the channel, is situated 880 yards east-southeast from Bourke Point; the island, nearly ob-long in shape, 440 yards long east and west, by 150 yards wide, is densely wooded, making it a distinct feature on the shore. Between Band and Niblett Islands, but farther from the channel, is a small island with a dangerously shallow spot lying 70 yards south of it. By keeping the west end of Niblett Island close on board a small vessel will find limited but good anchorage in the bay north of it.

Calvin Island, small, wooded and 13 feet high, lies 440 yards southeast from Gooseberry Island; it has several detached dry rocks lying off its east, south, and western sides, but from none does shoal water extend beyond 100 yards.

Band Island, about 25 feet high, and wooded, lies 590 yards eastward of Bourke Point, and shoal water extends from its south point 70 yards.

Bourke Point is a low thickly wooded point of the mainland, 2 miles southeast from O'Donnell Point. Though not a prominent feature, it is steep-to, and all vessels must pass southwest of it, where a depth of 10 fathoms will be found in the ship's track. Between O'Donnell and Bourke Points the mainland shore recedes from view, being hidden by several tiers of islands and rocks that present no conspicuous features on this monotonous shore.

Gooseberry Island, 15 feet high and fairly wooded, is only conspicuous when seen detached from the main shore; it is diamond shaped, 300 yards long east-northeast, by 150 yards wide, its middle lying 2.1 miles southeastward from O'Donnell Point. Dry rocks lie 250 yards from the south side of the island.

Clarke Rock, very small and 7 feet in height, is situated 590 yards west from Gooseberry Island, and shoal water extends north 100 yards to a depth of 5 feet and 300 yards to 11 feet.

The four following unnamed shoal spots lie, in regard to Clarke Rock, thus: A 12-foot rock nearly 1 mile 292° (NW. by W. $\frac{3}{4}$ W.); an 18-foot patch 1,320 yards on the same bearing; a 16-foot rock 1,320 yards 282° (WNW. $\frac{3}{4}$ W.); and a 13-foot spot 1,175 yards on nearly the same bearing.

A narrow channel south of Gooseberry Island was used during the survey in 1893 by keeping the entrance to Miners Creek in range

with the north side of the small rock at the end of Fairlie Island, bearing about 88° ($E \frac{1}{2} S.$).

Spohn Spit, with 7 feet water on it, lies over 1,320 yards southeast from The Sow and is the dangerous tail of a bank making out from the islands skirting the mainland, and to lead southwest of which take care to have Southeast Wooded Pine Island over the top of Clarke Rock, bearing 150° (SSE.).

Tryon Island, 16 feet high, is the most prominent feature on this shore, being the highest bare island in the vicinity. This island, less than 100 yards in diameter and surrounded by detached rocks, is situated 1 mile southeastward from O'Donnell Point; shallow water extends west and northwest 1 mile from the island.

Gahan Rock, with 11 feet water on it, the most important shoal near Tryon Island, lies 440 yards west-southwest from the island and 120 yards in the same direction from the nearest dry rock of the group. The vessel's track is close southwest of this 11-foot rock, which has to be guarded against by keeping rather closer to Pawsey Rock than to the dry rock just mentioned, keeping Southeast Wooded Pine Island its own width open southwestward of Clarke Rock, bearing 148° (SSE. $\frac{1}{2} E.$). One-fourth of a mile southeast from Pawsey Rock is the northeast corner of a bank with less than 6 feet on its shoalest part; from this corner the bank, 200 yards wide, stretches 440 yards west-southwest to a depth of 13 feet. The vessel's track is close northwestward of this bank.

Buoy.—An unpainted spar buoy marks Gahan Rock.

Pawsey Rock, small and 8 feet high, is situated 590 yards southeast by south from The Sow, with which it is connected by very shoal water. From Pawsey Rock very shallow water extends in southerly and southeasterly directions 100 yards, and a small dry rock lies 100 yards west of it.

Buoy.—A black spar buoy is moored southeast from this rock.

The Sow is a rather larger rock, 10 feet high, lying west by south 200 yards from the Pig, and is surrounded at 50 yards by three other and smaller rocks. A spur with 7 feet water on it stretches about halfway to the Pig, compelling vessels to keep the latter on board; shoal water also extends northward 150 yards to a depth of 6 feet. A very small rock, 5 feet high, lies 270 yards south from the Sow, with which it is connected by very shallow water. One-fourth of a mile west by south from the same is a small detached rock with 18 feet water on it.

The Pig, so named from the appearance of a large boulder on it, is 6 feet high and lies 1,175 yards southeast by south from O'Donnell Point. A vessel may pass on either side of the Pig, but the track usually taken is close west of it.

Hatch Island lies over 1,175 yards southeast from O'Donnell Point, being 300 yards long, 100 yards wide, about 20 feet high, and covered with pines; deep water approaches it to within 50 yards. Hatch Island forms the north entrance point of a limited anchorage with indifferent shelter.

O'Donnell Point of the mainland, is situated over 1,320 yards southeast from the west end of Jacques Island. The point, well wooded to within 100 yards of its end, is comparatively high, being about 25 feet above the water. It is surrounded on all sides by small rocks and reefs, but only those bordering Inside Channel will be described.

This channel, 300 yards west of O'Donnell Point, is only 40 yards wide, and in passing through Gillford Rocks should be kept close on board to avoid the very shallow spit extending from O'Donnell Point.

Directions, Inside Channel, from Big Davids Bay to O'Donnell Point.—After rounding the dry rocks westward of Ottley Island keep the northwestern side of the large bluff on Christian Island a little open northwestward of North Wooded Pine Island, bearing about 218° (SW.) astern until Black Rock is abeam, when change course to westward, getting on the range of the two beacons in King Bay, bearing 2° (N. $\frac{1}{4}$ E.). Proceed on the King Bay range, deviating a little to eastward while passing No. 10 Island (see track on chart), until the northern extremity of that island bears 245° (WSW. $\frac{3}{4}$ W.), when change course to northwestward, steering for the northern side of King Point 334° (N. by W. $\frac{3}{4}$ W.) until near Wood Island, when haul gradually to westward, passing to the northward of that island, when steer 272° (W. $\frac{1}{4}$ N.), passing close northward of Middle Rock until Fairlie Island is abeam, when steer 283° (WNW. $\frac{1}{4}$ W.), passing southward of Tully and Niblett Islands, northward of Calvin Island, and in mid-channel between Gooseberry and Band Islands. When Southeast Wooded Pine Island is open its own width southwestward of Clarke Rock steer 336° to pass, southwestward of Spohn Spit, in mid-channel between Gahan and Pawsey Rocks and between the Sow and the Pigs, then steer 311° (NW. $\frac{1}{4}$ N.), passing southwestward of Hatch Islands, until abreast O'Donnell Point.

In the absence of buoys or other navigational aids, the chart and local knowledge are the best directions for this channel. Those not locally acquainted are strongly advised against taking this channel without a pilot.

Outer islands and dangers from Northwest Pine Island to Gooseberry Island:

Steers Rock, very small and only 1 foot high, may really be called the northern limit of the long string called Pine Islands,

stretching from the rock in a general southeasterly direction $4\frac{1}{4}$ miles. Steers Rock lies 1,320 yards 293° (NW. by W. $\frac{1}{4}$ W.) from the northwest end of Northwest Pine Island, and 176° (S. $\frac{1}{4}$ W.) distant $2\frac{3}{4}$ miles from Clarke Rock.

While the rock itself has deep water close to it, it is surrounded at a moderate distance by shoal water. The south end of a small bank with 12 feet water on it lies 150 yards east from Steers Rock and extends north-northeastward 200 yards.

Two rocks, with 15 feet least water on each, lie 200 and 400 yards west-southwest from Steers Rock.

A rock with only 7 feet water on it lies 300 yards west-northwest, and another with 12 feet 590 yards northwest by west from Steers Rock.

The range for approaching Big Davids Bay passes 350 yards southeast of Steers Rock. A first-rate passage could be buoyed for entering Big Davids Bay northwest of Pine Islands. The surveying steamer *Bayfield* in 1893 frequently ran in here by keeping the summer house on Happy Go Lucky Island in range with a beacon on top of Block Rock bearing 62° (ENE. $\frac{1}{4}$ E.) and passed over not less than 21 feet (in low stages there may be 2 feet less).

Phillimore Rock, with 11 feet least water on it, is the shoalest of a long string of shoals extending southeastward to within 200 yards of the track. It lies 1 mile northward from the northwest end of Northwest Pine Island. From Phillimore Rock the string extends nearly 440 yards northwestward, where there is a depth of 14 feet, and 880 yards southeastward to a depth of 15 feet.

A rock, with 15 feet least water on it, lies nearly 1,175 yards southeastward from Phillimore Rock.

Mal de mer Bank is long, narrow, and dangerously shoal, extending in a southeast direction to within 300 yards of the track into Big Davids Bay. Its southeast and narrowest end lies 1 mile northeast from the northwest extremity of Northwest Pine Island. Thence the bank trends northwest 1,175 yards, with little more than 10 feet of water on any of it. Its greatest width is near the middle, and the bank is just detached from the main very shoal bank.

Lewis Bank, with 11 feet least water at its south end, is 200 yards long north and south, and narrow, and lies 200 yards from the southeastern extremity of Speke Bank.

Percy Rock, with 16 feet least water on it, and the outer dangerous rock in the immediate vicinity, is situated $1\frac{1}{4}$ miles south by west from Clarke Rock. It is surrounded by a bank upon which is slightly deeper water, but as the whole neighborhood is uneven, vessels should proceed with caution when so close in.

A rock, with 18 feet water on it, lies nearly 440 yards northward, and one with 15 feet on it a little over 440 yards in nearly the same direction from Percy Rock.

Norman Bank, with 7 feet of water, lies 440 yards southeast from Tottenham Shoal. The bank in a north-northwest direction is 440 yards long and narrow and only 100 yards from the southwest edge of Speke Bank.

Tottenham Shoal, with 4 feet least water on it, lies 1.175 yards southward from Clarke Rock. The narrow bank is 440 yards long in a north-northwest direction and only 100 yards from the southwestern edge of Speke Bank.

Speke Bank is just separated by a narrow channel, having 4 fathoms least water in it, from the reefs on the south side of Gooseberry Island. The bank is very shoal all over, the edges dropping in places from a couple of feet to 7 fathoms in a few yards distance. The outer and northwest corner, with 7 feet least water, is situated 440 yards southward from Clarke Rock. The bank, 440 yards wide at its north end, gradually tapers to 100 yards, and is $1\frac{1}{4}$ miles long in a north-northwest direction.

Inside or east of this bank is a narrow lane of deeper water fringing the bank fronting the islands in Big Davids Bay. Nearly in a straight line from Gooseberry to American Camp Island runs a string of low, dry rocks with very shoal water extending southwest from them. Vessels should avoid this vicinity.

O'Donnell Channel, the passage between Seaman Bank and the Sow, is a safe passage for vessels entering or leaving Inside Channel at O'Donnell Point, but in the absence of beacons and buoys no intelligible directions can be given.

Seaman Bank, with less than 6 feet water on it, is situated with its center over 1,320 yards west-southwest from the Sow on the western side of O'Donnell Channel. It has an average width of 300 yards, and from its middle bank extends northwest 440 yards to a depth of 14 feet and 590 yards southward to 18 feet.

Clearing mark.—To pass westward of Whyte Reef and Seaman Bank, keep the summit of McQuade Island touching the outer rock of Bass Group, bearing 340° (N. by W. $\frac{1}{4}$ W.).

One-third of a mile southeast from the middle of Seaman Bank is a small detached shoal with depth of 18 feet, and $\frac{1}{2}$ mile southwest from the Sow is a small rock with 12 feet water on it.

Whyte Reef, composed of five small dry rocks surrounded by shallow water, has a diameter of nearly 440 yards, its center being 1,320 yards westward of the Sow.

A rock awash lies 590 yards southward of the western end of Deer Island. The passage between them has a depth of 11 fathoms.

O'Donnell Point to Moose Point:

Gillford Rocks form a group the eastern one of which lies 350 yards westward from O'Donnell Point; from this rock the group stretches over 590 yards southwestward, with a width of 440 yards; the highest rock is 12 feet, and some have a few small bushes on them. As before stated, Inside Channel passes close to the northeast side of the group, and the other sides may be approached to 100 yards. A channel may exist between Gillford Rocks and Bass Group, but it was not examined.

Deer Island, situated a little over 1,320 yards southwestward of O'Donnell Point, is 26 feet high, wedge shaped, and 440 yards long west by north by 150 yards broad at the base and east side of the wedge. Viewed from the south, the island is conspicuous, the bare portion being light colored and surmounted by a large tuft of pines which appear detached from the trees on the main shore.

Excepting a spit with 10 feet water on its outer edge extending west-northwest from the west end of the island, the shores are quite steep-to, and good passages to Inside Channel exist on both sides of Deer Island.

Range.—The summit of Tryon Island (the only high bare rock on this shore) touching the north side of the Sow, bearing 103° (ESE. $\frac{1}{4}$ E.), leads toward Inside Channel south of Deer Island.

Bass Group is a cluster of islands and rocks lying from 590 to 1,175 yards southwest of Jacques Island; the highest is about 10 feet high and a few have some small trees upon them. The northeastern extremity of the bank surrounding the group with 9 feet water upon it, lies 590 yards south by east from the west end of Jacques Island and only 50 yards southwest from the steamboat track.

Cowie Reef is situated at its northwestern end with 3 feet water on it, 1.2 miles westward from the west end of Jacques Island. It is 880 yards long in a northwesterly direction and 440 yards wide; on the reef are several dry rocks, one near its northwestern extremity and some near the southeastern end $\frac{1}{4}$ mile west of Bass Group.

The outer shoal in this locality, with 18 feet water on it, lies nearly 880 yards west-southwest from Maxwell Rock. A small rock with the same depth on it lies 590 yards southwest of Maxwell Rock.

Maxwell Rock, flat and 5 feet high, is situated 1.1 miles southward from the western extremity of McQuade Island. Rocks awash extend 440 yards westward of Maxwell Rock.

Jacques Island lies with its southeastern extremity 880 yards 340° (N. by W. $\frac{1}{4}$ W.) from O'Donnell Point. Dry rocks lie 200 yards west of the western point of the island.

Bowes Island, 880 yards long east and west and about 100 yards wide, lies with its western extremity 440 yards east of the eastern extremity of Jacques Island. The two islands are connected by a bar.

Passage Island, 12 feet high, is situated west-northwest, a little more than 440 yards from the western extremity of Jacques Island. A dry rock lies 100 yards eastward of Passage Island, and between this rock and those lying near the western end of Jacques Island 11 feet water was carried in 1891 with the assistance of buoys.

Hood Reef, with less than 6 feet on its eastern end, is oval shaped and lies with its center 440 yards 36° (NE. $\frac{1}{4}$ N.) from the western extremity of Jacques Island.

Eagar Rock, with less than 6 feet on it, lies about 440 yards northward of Passage Island.

Haha Rock, with $1\frac{1}{4}$ fathoms on it, lies 880 yards northwestward of Passage Island.

Another rock, with $1\frac{1}{4}$ fathoms on it, lies about halfway between Eagar and Haha rocks.

Milligan Island, narrow and 15 feet high, is situated 300 yards southward of the Jubilee Island group. A shallow rocky bank extends eastward from the group, leaving, however, a narrow passage close to the islets on the southeastern side of Starvation Bay, through which, with the assistance of buoys, 18 feet can be carried in as far as Manitou Gap. The light-draft steamer running between Penetanguishene and Parry Sound Town appears to cross the shallow rocky bank above mentioned, assisted by a red spar buoy.

Manitou Gap.—Near the western end of Milligan Island is a cluster of small, dry rocks which extend southwestward from the point 200 yards. There is no passage between, but on the northwest side of these rocks there is a narrow passage called Manitou Gap, through which not less than 12 feet was carried, by keeping close to the islet 100 yards westward of these rocks. A passage may be had out into the bay by keeping the beacons used by the surveying steamer *Bayfield*, in 1891—if still standing and can be recognized—in range astern, bearing 80° (E. $\frac{1}{4}$ N.).

Beacon—Buoy.—The northwest side of the Gap is marked by a white beacon and a black spar buoy.

Armstrong Rock is a small danger with 2 feet water on it, lying 440 yards southward from the west end of McQuade Island.

McQuade Island, 16 feet high, with a few bushes on it, is the outer one of a large group lying southwestward of Moose Point; these islands are so close together that they appear from seaward as a headland.

Channel Rock is the southeastern and highest of a group of bare rocks lying 440 yards northwestward of McQuade Island, the navigable channel, however, being contracted to half that distance by shoal water from McQuade Island. Channel Rock is 11 feet high and conspicuous, with deep water close to its eastern side.

Wagstaff Rock, with 7 feet water on it, lies 590 yards east by north from Channel Rock. During the progress of the survey in 1891 a buoy was placed on Wagstaff Rock and a pair of range beacons put up on shore, which together with a beacon on Channel Rock bore when the three were in range 60° (ENE.). In approaching from seaward Channel Rock was steered for on this bearing, and after passing 50 yards southward of it the inside beacons were again brought in range, and so kept until the regular track was reached or the anchorage in Starvation Bay steered for.

Jubilee Island is the eastern island of the group lying southward of Moose Point, and in 1891 could be recognized by its summer house and flagstaff.

Buoy.—A red spar buoy is placed about 230 yards southeast of Jubilee Island.

Cone Island, 15 feet high, is, as its name indicates, a sharp topped little bare rock lying 880 yards westward of Moose Point.

McKechnie Rock, 2 feet above the water, is situated 590 yards west by north from Cone Island, and the ship's track is between them, as indicated by the broken line on the chart. A passage also exists between McKechnie Rock and the McQuade Island Group, with a depth of 15 feet in 1891.

Starvation Bay is the clear space eastward of Jubilee Island, and good though limited anchorage may be had in the place indicated on the chart by the anchor, in 5 fathoms, and out of the way of passing vessels.

Moose Point.—The broken-up rocks composing Bass Group, Cowie Reef, Gillford Rocks, and Deer Island form what is locally known as Moose Point, but for some reason the name is officially transferred to a point of the mainland 2 miles farther north. Southward 270 yards from the southwest part of O'Donnell Point is a small dry rock surrounded by shoal water to a distance of about 75 yards, the vessel's track passing 150 yards southwestward of this rock.

Outlying island and dangers between Giants Tomb Island and Moose Point.—

Western Islands (The Westerns) are a group of small islands and rocks of Laurentian formation lying northeast of the track of vessels from Cabot Head to Matchedash Bay and just southwest of the line joining Red Rock (Parry Sound) with Hope Island Lighthouse. They occupy an area of about 10 square miles, the group being $5\frac{1}{2}$ miles long in a northeast and southwest direction by about 3 miles broad. Double Top Island Lighthouse on the southwestern of the group is $12\frac{1}{2}$ miles 312° (NW. $\frac{3}{4}$ N.) from Hope Island Lighthouse. Northeast Rock, occupying the position indicated by its

name, is $19\frac{1}{2}$ miles 161° (S. by E.) from Red Rock Lighthouse and $7\frac{3}{4}$ miles 274° (W. $\frac{3}{4}$ N.) from the western islet of Bass Group, commonly called Moose Point.

Most of the islands are bare of trees, small, and not very high, the water in the vicinity being generally very deep even close to the rocks. The shoals in consequence are especially dangerous, the lead giving little warning, and in the event of striking a vessel is liable to founder in deep water.

North Island, as its name indicates, is the northernmost of Western Islands and is wooded, excepting the eastern end, which is 50 feet high. The island is a little over 440 yards long northeast and southwest and, including the adjacent rocks, double that distance in length. Good landing may be had in moderate weather on the south side.

The water is deep close to North Island, rendering it a safe object to make for if bound from Owen Sound to Parry Sound via Wabuno Channel, in which connection it may be stated that the course from Vails Point Shoal Lightbuoy to North Island is $33\frac{3}{4}$ miles 43° (NE. $\frac{3}{4}$ E.). Lone Rock is $5\frac{1}{2}$ miles 45° (NE. $\frac{3}{4}$ E.) from North Island.

Caution.—The course from Owen Sound leads only 300 yards northwest from Western Islands South Group Shoals.

Northeast Rock, 12 feet high and bare, with two small dry rocks close to its west side, has deep water all round it excepting on its north side whence a shallow spur extends 100 yards. A depth of 30 fathoms will be found 200 yards eastward from the rock.

Between western islands and Lone Rock the bottom is very uneven, and it is possible owing to the small size of some of the rocks on this shore that less water may exist; care therefore should be taken by the master of a vessel to stop and get a cast of the lead on any place having the appearance of discolored water.

Western Islands consist practically of two clusters named North and South Group, separated by a good channel a little over 2 miles wide and over 10 fathoms deep. A detailed description will now be given of North Group:

One Tree Island lies nearly 880 yards south of North Island and may be easily recognized by its single pine; it is really composed of two islets 30 feet high, and having, together, a diameter of 300 yards. Westward 200 yards from the island is a very small dry rock, and very shoal water extends 100 yards farther in the same direction. One-fourth of a mile northward from One Tree Island is a small rock with 18 feet water on it, and a shallow bank with 9 feet on its outer edge extends north from the northwest side of the island 200 yards.

A small dry rock 40 yards in diameter and about 10 feet high, lies midway between One Tree Island and Northeast Rock; shoal

water extends 75 yards south, and a small shoal with 21 feet water on it lies 300 yards northeast from it.

Long Island, 42 feet high, lies 440 yards southwest from the nearest part of One Tree Island. It is elliptical in shape, a little over 440 yards long east and west, and 200 yards in greatest width. Small dry rocks extend 200 yards westward from its west end, and shoal water 50 yards further.

The southern part of North Group is composed of seven small islands and many small rocks close together; the northwestern island has a few trees on it, making the height appear about 100 feet, the others are bare. The whole cluster is nearly circular and about 590 yards in diameter.

Westward 200 yards from the northwestern island of the cluster is a very small dry rock 5 feet high, and 100 yards farther west is a rock awash.

Northeastward 200 yards from the northeastern islet of the cluster is a dry rock 10 feet high and 100 yards in diameter, connected thereto by a shallow bank but has deep water on its north side. Southeastward 150 yards from this dry rock is a spot with 10 feet water on it, and 440 yards farther in the same direction is a patch with depth of 17 feet. Southeastward 150 yards from the northeastern islet, is a spot with 16 feet of water on it.

The southwest, south, and southeast sides of this cluster have deep water close to them; Long Island and the latter are connected by a bank over which it is not safe to venture. Long and One Tree islands have a passage between them, as have also, North and One-Tree islands.

Western Islands Harbor is situated in the middle of the cluster just described, and contains such very limited space that even small vessels can not swing at anchor, but have to make fast to the rocks; the shelter, too, is not very good as the islets are small, and some sea with a strong current runs between them. The entrance to this harbor is on the northeast side of Crescent Island (the south islet of the cluster) and must be approached from the southeast.

Southeast Rock, and Black Rock, lying near it, are quite detached from North and South groups. The former, 18 feet high, is in two parts, both small, occupying a space of 200 yards long north and south, by 100 yards wide. Southeast Rock is 2.6 miles 176° (S. $\frac{1}{4}$ W.) from Northeast Rock, and the water close round the former is deep, but the following detached spots lie in the vicinity:

A small rock with 8 feet water on it, 440 yards 236° (SW. by W. $\frac{1}{4}$ W.), and another with 10 feet 1,175 yards 207° (SW. by S.) from the highest part of Southeast Rock. Both have deep water close to them, necessitating a good lookout when in their vicinity.

A bank with 4 feet on it is situated 440 yards northeastward of the same, and a depth of 7 feet 200 yards farther in the same direction.

Black Rock, 11 feet high and 50 yards in diameter, lies nearly 880 yards westward from Southeast Rock, and outside the distance of 50 yards the water is deep.

South Group.—**Jagged Island**, 35 feet high and quite bare, is situated $1\frac{1}{2}$ miles northeastward from Double Top Island; it has the shape of an equilateral triangle, the east side running north and south. Northeastward 100 yards from its northern point is a small dry rock with deep water close to it, and, from its southwestern point a string of low rocks extends 300 yards in a westerly direction; these rocks have deep water close to them. A small shoal with 11 feet water over it, lies 200 yards from the northwestern side of the island.

A small rock with 19 feet water over it, lies 880 yards north-northwestward of Jagged Island, and another with 15 feet lies eastward a little over 500 yards from the same.

Deaf Man Shoal, with 12 feet water, is situated nearly $1\frac{1}{2}$ miles east-northeast from Jagged Island, and marks the northeastern termination of the 10-fathom bank; it lies also west by north the same distance from Black Rock.

Gull Island, 44 feet high, nearly circular and 150 yards in diameter, lies 440 yards southeast by south from Jagged Island; two small low, dry rocks lie 150 yards northward of Gull Island, and another rock lies 100 yards from its southeast side. On the west side the water is fairly good, but a very shallow bank connects it and Jagged Island, extending 440 yards northeast of the line joining their north-east sides, where there is a depth of 18 feet with only 8 feet close to it.

From Gull Island a bank extends nearly 880 yards east-southeast, where the depth is 16 feet; at half that distance the depth is 8 feet, with very shallow water closer to the island. The southern end of a detached bank with 13 feet water on it lies 590 yards eastward from Gull Island, it being 440 yards long north and south, and 100 yards wide.

A small rock with 18 feet water on it lies 1,175 yards southeast, and one with less than 6 feet 590 yards west-northwest from Gull Island.

Block Island, 18 feet high, bare, and about the size of Jagged Island, lies a little over 590 yards southward from Jagged Island; shoal water extends westward 150 yards from its north point, and a dangerous rocky bank joins Block to Gull Island.

Thumb Rock is a small bare triangular rock, 22 feet high, situated 1,320 yards eastward from Double Top Island. Dry rocks extend southwestward 200 yards, and a bank with 12 feet 440 yards in the same direction. Shallow water extends 100 yards from the other sides of the rock. A rock with only 5 feet water on it lies 440 yards southeast from Thumb Rock. Jagged, Gull, and Block Islands,

with Thumb Rock, are situated on a common 10-fathom bank which extends $1\frac{1}{4}$ miles northeast from Jagged Island and $2\frac{1}{4}$ miles southward from Gull Island. The bank has an average width of $1\frac{1}{4}$ miles, nearly all of it lying eastward of the above islands.

Anchorage.—In the vicinity of the Westerns anchorage in convenient depths is not easily obtained, but this bank offers such a purpose, although the bottom is hard, with no shelter.

Southeastward a little over 1 mile from Thumb Rock is a small shoal with depth of 20 feet.

Double Top Island, 28 feet high and quite bare, is 200 yards long east and west and about 40 yards wide. It is nearly divided in two; hence its name. It is steep-to and may be easily recognized by the lighthouse, fog-alarm building, and keeper's dwelling.

Western Islands Light, flashing white, 74 feet above water, visible 14 miles, is shown from a white octagonal wooden structure on the western end of Double Top Island.

Fog signal.—The fog signal is made on an air diaphone.

Dangers near Double Top Island.—In the vicinity of Double Top Island and surrounded with deep water are the following sunken rocks:

A rock with 7 feet water on it lies 1,320 yards 255° (W. $\frac{1}{2}$ S.); a spot with 18 feet lies nearly 1 mile 265° (W. $\frac{1}{4}$ N.); a patch with 16 feet lies 1,175 yards 276° (WNW. $\frac{1}{4}$ W.); and a rock with 8 feet water over it nearly 590 yards eastward from Double Top Island Lighthouse.

Caution.—Shoals have been reported as lying farther from Western Islands, but the survey in 1892–93 failed to discover them. Masters of vessels are, however, cautioned to keep a very careful lookout in the vicinity of the Westerns, as the shoals are very small and might be easily missed by the ordinary methods of sounding. The water about these islands is comparatively clear, and discoloration can be seen some distance.

Northeastward 440 yards from Double Top Island Lighthouse is a very small rock 7 feet high, steep-to on its southwest and west sides, but a shallow bank with depths of less than 6 feet extends northeastward 440 yards, with an average width of 250 yards.

West Rock, 21 feet high, quite bare and small, is situated 880 yards north-northwest from Double Top Island and is the most westerly rock of South Group. It is surrounded by detached dry rocks, which are steep-to. One-half a mile eastward from West Rock is one of about the same size, 24 feet high, with deep water about it.

Pool Rocks are situated 880 yards northeastward from West Rock. The cluster consists of four small rocks (the highest 17 feet high) lying close together and having deep water all round them,

excepting for a shoal with 15 feet water on it lying 250 yards east-southeastward.

The passages through the groups appeared to be clear during the survey of 1892-93, but as they are not of much practical advantage to general navigation a casual examination only was made.

Directions—Pinery Point to Moose Point.—From a position about 200 yards eastward of the red spar buoy marking the end of the spit from Pinery Point steer 344° (N. $\frac{1}{2}$ W.) for the northwestern end of Smooth Island until the gap between the southeastern end of the same island and Skylark Rock bears 3° (N. $\frac{1}{2}$ E.). The beacons on Minnicoganashene Island in range 4° (N. by E.) will lead over the bar with 11 feet (in low stages there may be 2 feet less).

When the Tomb is over the highest part of Smooth Island, alter course northwestward to pass 25 yards from the islet lying close to the south side of Minnicoganashene Island, heading for the middle of the small island forming the northeastern extremity of Giants Tomb Island to avoid the 5 foot rock on the port hand. Steer thus until the eastern side of McLeod Island is in sight, when haul sharply northeastward to pass between the spits from Keating and Minnicoganashene Islands by keeping the west side of the latter in range with the east sides of Buller and McLeod Islands, bearing 32° (NE. $\frac{1}{2}$ N.).

Keep now in midchannel between Governor and Minnicoganashene islands and pass 150 yards southeast, and northeast from Gull Rock. Pass the same distance northeast of Kindersley Island and 100 yards southwestward of Long Point Island; immediately after passing the southern point of the latter bring the east side of Maxwell Island close on board. Pass Muskoka landing wharf 30 yards distant and steer a little northeastward of Cognashene Point so as to bring the southwest side of the island between Cognashene Point and Townsend Island just open northeast of Cupid Island, bearing 313° (NW. $\frac{1}{2}$ N.) before Birchall Island is reached.

Pass 40 yards northeastward of Cupid Island and the same distance southwest from Cognashene Point; thence, keep 75 yards from the northeast shore. After passing midway between Townsend and Newton Islands steer for Red Rock beacon in range with the east side of the Split Rock group bearing 306° (NW. $\frac{1}{2}$ W.)—the latter shows up well as an island—and the southwest fall of Beausoleil Island astern. When the isthmus on Beckwith Island is in range with the northeastern end of Giants Tomb Island, bearing 237° (SW. by W. $\frac{1}{2}$ W.), Barnard and Monkhouse Banks will be passed.

Gradually bring the small gap in the bluff on Beausoleil Island over the west side of Townsend Island bearing 147° (SSE. $\frac{1}{2}$ E.) with the middle of the Split Rock group ahead. This will take a vessel past Mather and Donald Rocks on the port hand, and Rickcord with Red Rocks on the starboard hand. When abreast of the latter haul north-

ward a little to bring the east side of the Split Rock group a little on the port bow, which should carry a vessel 150 yards southwest of Felix Rock, and 300 yards northeast of the northern Valentine Rock, until the Felix and Woore Rocks beacons are in range bearing 123° (SE. $\frac{1}{4}$ E.) and the south end of Single Rock ahead bearing 303° (NW. $\frac{1}{4}$ W.).

This range should clear all the shallow water from Split Rock, and lead over the northeast part of Bolster Bank in not less than 14 feet excepting in low stages when there may be 2 feet less. The channel here is very crooked and local knowledge will be of great assistance. Unless certain of the channel, speed should be reduced, the lead kept going, and a good lookout kept.

When North Watcher Island is in range with the south end of Gray Island proper, bearing 245° (WSW. $\frac{3}{4}$ W.), haul northward a little, and steer for Deer Island 315° (NW. $\frac{3}{4}$ N.), with the southern Valentine Rock over the stern. This should carry a vessel past the spit from Delf Island, and Superior Shoal Buoy.

When past these shoals, haul northward and steer 340° (N. by W. $\frac{1}{4}$ W.) for Kerr Island beacons in range.

When close to Kerr Island, pass 50 yards southwestward of it, 100 yards northeastward of the southeastern Allen Rock, and the same distance southwest of the highest Teat and Spray rocks. Bring the northeast side of Kerr Island in the middle of the gap between Allen and Teat rocks bearing 122° (SE. $\frac{1}{4}$ E.) to pass between Digby Bank and the rock just showing a little over 590 yards southwest of Otley Island. Run 300 yards past this rock, and then steer 38° (NE.) for the middle of Big Davids Bay.

When west of Black Rock, keep the beacons on the islet in King Bay in range bearing 0° (N. $\frac{3}{4}$ E.); pass 150 yards north of Wood Island, 75 yards north of Geraldine Island, and midway between Ward Island and Middle Rock. After passing the latter, steer for the gap south of Gooseberry Island until past Fairlie Island, when alter course to 285° (WNW.), passing midway between Calvin and Niblett islands, and midway between Gooseberry Island and Bourke Point with North Island of the Westerns a little on the port bow.

Keep thus until the western side of North Wooded Pine Island is over the western side of Clarke Rock bearing 157° (S. by E. $\frac{3}{4}$ E.). Now turn slowly northward to pass between Spohn Spit and the reef northwest of it. When past the latter, and before Tryon Island is over the southwestern dry rock off it, see that Southeast Wooded Pine Island is its own width open southwestward of Clarke Rock 147° (SSE. $\frac{1}{4}$ E.). Steer 327° (NNW. $\frac{1}{4}$ W.) on this range to pass between Pawsey and Gahan rocks.

Pass 50 yards west of The Pig, heading well inside O'Donnell Point until Tryon Island is open northeast of The Pig, when steer for the highest part of Gillford Rocks, passing 150 yards southwest of the small dry rock south of O'Donnell Point. Keep thus until the channel east of Gillford Rocks is closed, when haul northward, opening the channel again, pass close to the southeastern rock and keep this group close on board. For 440 yards after leaving this narrow channel, steer for the middle of the gap between Passage and Jacques islands; then haul northward so as to bring Passage Island a point on the starboard bow. Steer thus until the channel between Passage and Jacques islands opens, when steer 17° (NNE. $\frac{1}{2}$ E.), keeping about midway between Jacques and Passage islands. When the eastern end of Milligan Island is in range with the western side of Starvation Bay, bearing 29° (NE. $\frac{1}{2}$ N.), steer 348° (N. $\frac{3}{4}$ W.) until the southeastern extremity of McQuade Island bears 298° (NW. $\frac{1}{4}$ W.), when steer 80° (E. $\frac{1}{4}$ N.), hauling to northwestward pass between the red and black buoys on the northwestern side of the gap. When past these buoys, steer northward to pass between the red buoy and Jubilee Island, then northwestward to pass between Jubilee Island and the 2-fathom spot 200 yards northward of it.

Moose Point to Parry Sound.—**Track Island** is small, wooded, and 15 feet high, lying $1\frac{1}{4}$ miles northwestward of Moose Point. Between it and Minninminnis Island is the ship's track, the west side being marked by a black spar buoy.

A glance of the chart will show that the passage between Track Island and McCurry Rocks is very much contracted by the shallow bank from the former, and no master of a vessel should attempt this portion of the channel without local knowledge.

It is possible to carry through a depth of 15 feet in the right track, but it would be useless to attempt to give directions. The master of a vessel should follow the track shown on the chart as closely as possible, assisted by the buoy above mentioned, taking care to avoid the rock with 3 feet water on it lying 200 yards southward of the southeastern islet of the Track Islet Group.

Minninminnis Island lies on the east side of the passage and 1 mile southward of Double Island; it may be easily recognized from the north by the high steep bare face on the northern point.

Forage Island, 15 feet high, is situated a little over 440 yards southeastward of Track Island. It sets in the center of a shoal bank which is about 1,320 yards long.

A bank, nearly 880 yards long north and south and 220 yards in width, lies 880 yards westward of Forage Island.

Mercer Rocks, 3 feet above the water, lie about 1,540 yards northwestward of McQuade Island.

Harris Bank, a little over 440 yards long northeast and southwest, lies nearly 1,320 yards northwestward of Mercer Rocks. There is less than 6 feet on its northeastern extremity.

Rowland Rock lies about 1,320 yards north of Mercer Rocks.

Lone Rock is an isolated, small, light-colored rock of granitic character 3 feet above water, located about $6\frac{1}{2}$ miles northwestward of Track Island. As it is but 10 feet broad it is only on very calm days that it appears like a dry rock. Usually the swell and waves beating against its abrupt western face give it the effect of a rock covered, or awash. Formerly a beacon was erected upon this little rock, but the sea and ice proved too much for it, and, in falling, its round top was cleft in two, causing the steep western face above mentioned. This steep face causes the westerly seas to bounce up to a great height after striking it, thus, in the absence of the buoy, assisting in its recognition.

Caleb Island is the nearest dry land to Lone Rock, lying a little over 3 miles 27° (NE. by N.) from the latter. Its great distance offshore renders Lone Rock and the shallow spots southeastward of it very formidable dangers in thick weather.

Light and bell buoy.—A red cylindrical buoy, exhibiting an occulting red light, is moored 100 yards southwestward of Lone Rock.

Fog signal.—The fog signal is made on a bell sounded by the action of the waves.

Dangers between Lone Rock and the mainland.—**Hans Rock**, with 4 feet water on it, is 1.9 miles 141° (S.E. $\frac{1}{2}$ E.) from Lone Rock.

Barbara Bank consists of three distinct patches of shallow rocks, the middle one being level with the surface of the water in and a little over $1\frac{1}{2}$ miles east-southeast from Lone Rock.

Dauphine and Pelican Rocks, each with 13 feet water on it, lie rather more than 1,320 yards eastward of Barbara Bank; the former situated $1\frac{1}{2}$ miles west-northwest from Haystack Rock.

Wabuno Rock, with less than 6 feet on it, lies 1.1 miles west-northwest from Channel Rock. A spot, with 9 feet on it, lies 300 yards northwestward of Wabuno Rock; a depth of 20 fathoms will be found close westward of these two dangers.

Haystack Rock.—Although not near the track under description, this dark-colored bare islet is conspicuous from seaward, especially in the forenoon with the sun eastward of it. It has an almost inaccessible lump on the southern extremity shaped like a double tooth, being about 10 feet above the water.

Guy Rock, with 11 feet water on it, lies midway between the eastern extremity of Copperhead Island and Double Island.

Double Island, 28 feet high and wooded, is just divided into two parts, hence its name; it is the first conspicuous island on the west side of the track south of Copperhead Island, being distant therefrom 1,320 yards.

Gaviller Island, 30 feet high, lies a little over 440 yards eastward of Copperhead Island, and midway between them is the ship's track.

Copperhead Island, 20 feet high, is the southeastern of a large group separated from Frying Pan Island by a channel 200 yards broad and 7 fathoms in depth. This island in that year contained a small fishing establishment and wharf near the north point, at which, however, the water is shallow.

Anchorage.—Good anchorage in 5 fathoms, mud, may be had in the bay called Copperhead Harbor, westward of the houses.

Pierce Island is situated eastward of Frying Pan Island, and may be recognized by several houses belonging to the Hamilton Canoe Club, which usually camps for the summer months near the cliffy southwest extremity of the island. Off this point lie two small rocks, the southern of which is 1 foot above water. This rock, together with the small spit from the east point of Frying Pan Island, narrow the channel to a width of only 100 yards, but in which there is a depth of 4 fathoms.

Frying Pan Island is about 20 feet high, flat, thinly wooded, and $1\frac{1}{2}$ miles long north and south by 880 yards in greatest breadth, its north point being 1,320 yards southward of Wild Goose Island. It is separated from Kribbs or Hardie Island on its northwest side by a similar passage fit only for boats. The latter island may be recognized by its dark timber, elevation, and three summer houses.

The ship's passage in 1891 was between Kribbs or Hardie Island and the pair of islands lying 590 yards north of the north point of Frying Pan Island, but in 1914 vessels passed eastward of this pair of islands and also east of the black buoy marking the 3-foot rock mentioned below. On the southern part of the eastern coast of Frying Pan Island is a small fishery establishment and small wharf. At the back of this fishery is a snug little harbor with 4 fathoms water, in which a short vessel will find good shelter, the entrance to the harbor being 250 yards northward of the houses.

A rock, with 3 feet water on it, lies 440 yards north-northeast from the north point of Frying Pan Island, being connected thereto by a stony flat, over which 12 feet was carried in 1891 (in low stages there may be 2 feet less).

Buoy.—A black spar buoy is moored on the east side of this rock.

A small rock, 8 feet high, is situated 440 yards east by north from the same extremity of Frying Pan Island, the passage being contracted to half that width by a bank extending eastward of that extremity, rendering this portion of the channel difficult to take.

Wild Goose Island takes its name from a sloping pine tree with a top branch (1891) resembling somewhat a goose on the wing, near the southern extremity. The island is $1\frac{1}{2}$ miles southward of the passage between Gauge and Round Islands, and, before the survey in 1891, vessels used to pass between it and a conical bare rock 15 feet high, lying 350 yards northwest from the south point of Wild Goose Island; but, as a rock with 6 feet (and in low stages there may be 2 feet less) water on it lies on this line and nearly in mid-channel, this passage (without the rock were buoyed) is not recommended but that westward of the rock 15 feet high.

Appelbe Island, 10 feet high, lies a little over 880 yards westward of Frying Pan Island.

Ricketts Island, 20 feet high, lies a little over 880 yards southwestward of Wild Goose Island.

Hillier Island, 7 feet high, lies about 1 mile southwestward of Ricketts Island.

Hampshire Rock, with a least depth of $2\frac{1}{2}$ fathoms on it, lies about 1,100 yards westward of Hillier Island.

Griffiths, Leonard, and Ajax Islands are three of a large group sheltering the northern portion of the inside passage now under description.

Gauge Islands are a group of small islets northeast of and separated from the northern one of the large group just mentioned by a shallow passage 250 yards broad. The name was given to this small cluster on account of a batten fastened to the northeastern islet to indicate to the Midland and Parry Sound steamer the depth of water in South Channel. Deep water will be found close to the northeast side of Gauge Islands.

Caution.—A sunken rock with not much water on it is reported to lie about midway between McBrien and Gauge Islands, a little more than 590 yards west-northwest from the northeastern islet.

During the progress of the survey in 1891 the surveying steamer *Bayfield* anchored for the night frequently between Griffiths and Leonard Islands in 5 fathoms, mud bottom, and sometimes between Griffiths Island and the northern Gauge Island in 8 fathoms, over sand, and in approaching these anchorages from Wabuno Channel used to keep the southeastern Black Rock in range with the middle of Chamberlain Island, bearing 52° (N. E. by E. $\frac{3}{4}$ E.).

Round Island, small and wooded, is situated 350 yards northeastward of Gauge Islands, the ship's channel between them being further contracted by a shoal making off westerly 150 yards from the southwest point of the former.

McBrien Island, about 30 feet high, is a conspicuous wooded island with a summer residence upon it in 1891, lying 1,320 yards

northeast from Edward Island, and 440 yards southwest of Turning Island.

Edward Island, low and wooded, lies a little over 590 yards eastward of the Caleb Island group, and between them there is no passage for a ship. The north side of Edward Island has a depth of 4 fathoms close to it, in consequence of which vessels using this passage pass close to it to avoid a dangerous reef the southern end of which approaches to 200 yards of the north side of Edward Island.

Black Rocks, 590 yards southeast from Edward Island, are two in number and dark colored as the name indicates. The southeastern one is the larger, saddle shaped, and 8 feet above the water, and both are steep-to with the exception of a flat which extends 150 yards north and northeastward.

Directions, Moose Point to South Channel.—No directions are offered for this section of the inside channel; local knowledge is necessary.

CHAPTER VIII.

GEORGIAN BAY—GRONDINE POINT TO MCCOY ISLANDS.

The low water of 1895 (579 feet above mean tide at New York) was 4 feet below the datum used for this chapter.

White Rock, 9 feet high, is situated 3 miles eastward of Grondine Point and south-southwest 440 yards from Eagle Nest Point. It is really composed of five small bare rocks, one of which is of dark color in contrast to the highest, which is lighter in color than the coast adjacent. Standing well offshore, its light color renders it a conspicuous object on a coast where there are few characteristics. The shore between Grondine Point and White Rock is broken up into innumerable small islands, and is called Indian Bight, on account of the neat little village of Indians situated on the west side of the indentation about $1\frac{1}{2}$ miles from Grondine Point. The best way to communicate with this village is by Collins Inlet.

Caution.—Owing to the dark color of the water in this vicinity, coupled with the lumpy character of the bottom, shoal spots may be missed after the most carefully executed survey by the ordinary methods; great care is therefore especially necessary when navigating in the vicinity of French River.

Voyageurs Channel.—On the eastern side of this bight is situated the entrance to the western mouth of French River, up which for $3\frac{1}{2}$ miles 6 feet of water was carried in 1886. This particular outlet has been named Voyageurs Channel, as it was by this route that the canoes in the early days are said to have entered Georgian Bay from Lake Nipissing on their way westward. The whole of this bight is full of dangerous ledges and should be carefully avoided by vessels in thick weather by not standing into less than 10 fathoms.

White Rock Ledge extends from White Rock westward over 1,320 yards, terminating in a couple of rocks a few inches above the water.

Fort Channel is the second mouth of French River, situated nearly $1\frac{1}{2}$ miles eastward of White Rock, and joins Voyageurs Channel at about $1\frac{1}{2}$ miles from the entrance. It is reported that there still exists in the locality the remains of a fort from which the passing brigades used to be attacked in the early days, and from which circumstance this mouth takes its name. The surveying steamer, for the convenience of carrying on the work in Fort Channel, anchored about 1,320 yards below its junction with Voyageurs Chan-

nel, but the entrance from Georgian Bay is so blocked with rocks of a pinnacly nature that the master of a vessel should not think of attempting it.

Maitland Bank is a dangerous shoal, extending in a southwesterly direction from the coast immediately eastward of Fort Channel, with depths on it varying from 12 feet to a few inches. One mile from the shore the bank breaks up into a number of shoals.

Pring Reef.—This shoal, with only 9 feet water over it, is situated $1\frac{1}{4}$ miles southward of White Rock and lies 3.6 miles 90° (E. $\frac{1}{2}$ S.) from Grondine Rock. Between this and the main body of Maitland Bank the shoals have depths on them varying from 14 to 18 feet.

Temple Rocks are a group lying a little more than 1 mile westward of Bad River Point. The highest is 4 feet high, and the outer rock is 1,320 yards from the general shore line. From this outer stone the shallow bank continues in a southerly direction.

Emery Reef.—This dangerous obstruction, with only 5 feet water upon it, lies west-southwest $1\frac{1}{4}$ miles from Bad River Point and $3\frac{1}{4}$ miles 282° (WNW. $\frac{1}{4}$ W.) from Bustard Rocks Lighthouses.

Isabel Rock, with 14 feet water over it, is situated a little over 1,175 yards south-southwestward of Emery Reef and 3.6 miles 270° (W. $\frac{1}{2}$ N.) from Bustard Rocks Lighthouses; care should be taken to avoid this patch in a large-draft vessel and heavy sea.

Bad River.—This is the third or middle one of the five mouths by which French River empties into Georgian Bay. Tugs have gone some distance up this river for lumbering purposes.

Bad River Point is situated at the mouth of the river, and although called a point, because it appears as such from the direction of the mouth of French River proper, it is in reality only one of the innumerable islets which compose the coast line of the whole of this shore. Being bare and about 12 feet high it is rather more conspicuous than the rest of the adjacent coast. From it the broken-up coast trends $3\frac{1}{4}$ miles in a general east by north direction to Depot Island, the west entrance point to French River proper.

Mary Grant Rock, with 2 feet water on it, lies southward 880 yards from Bad River Point, and a patch, with 13 feet on it, is situated in the same direction and 1,320 yards from Bad River Point.

Everard Reef, 2 feet above the water, lies 2 miles eastward from Bad River Point and north by east 1.3 miles from Bustard Rocks Lighthouses; nearly 880 yards southwest of it there is a patch with 10 feet water on it, while at 300 yards, on the same bearing, there is less than 6 feet. Shoal water extends over 1 mile southwestward from Everard Rock in patches, but on none has there been found less than 3 fathoms of water (1886).

Turnaway Rock, 4 feet high and bare, is the southwest end of a ledge extending from Depot Island in a southwesterly direction 1,175

yards; the fairway range of the two French River Range Lights in range bearing 27° (NE. by N.) leads 150 yards southeastward of this ledge.

Northwest Bank, with from 5 to 10 feet water over it, is a dangerous and shallow rocky ledge extending in a general southwesterly direction 1 mile from Turnaway Rock. The fairway north-east range of the Bustard Rock Lighthouses, in range bearing 220° (SW. $\frac{1}{2}$ W.), leads 200 yards southeastward of the bank.

Bustard Islands.—This important group of islands and rocks is situated $1\frac{1}{2}$ miles southward of the entrance to French River proper, South Point $19\frac{1}{2}$ miles 97° (ESE. $\frac{1}{4}$ E.) from the north end of Green Island and $15\frac{1}{2}$ miles 303° (NW. $\frac{1}{2}$ W.) from Gereaux Island Lighthouse, Byng Inlet. This group has an extreme length of nearly 4 miles and is 2 miles broad in a north and south direction.

It is broken up into an almost innumerable number of islands, islets, rocks above and rocks below water of every size, shape, and description. They are composed, like the remainder of the shore, of gneiss, with occasional dark veins of hornblende character, possibly indicative of larger hidden masses of the same which may contain magnetite, and account for the abnormal variation of the compass observed in this locality.

Bustard Islands when seen from the south are scarcely distinguishable from the main shore, but from the west the higher character of the north side, together with the gap caused by the little harbor, render them unmistakable. In the afternoon, too, the sun shows up the three white lighthouses on Bustard Rocks. The string of rocks which extends 1,320 yards southwest by west from the lighthouse is usually known as Bustard Rocks by reason of being utterly bare of vegetation.

Southwest Rock is the outer one of the chain just spoken of; it is 5 feet high with a spit extending 200 yards from it in a west-southwesterly direction.

Perley Rock, with 9 feet water over it, lies 1,175 yards westward from Southwest Rock, and another, called Belize Rock, with 12 feet on it, lies 1,175 yards southward from Southwest Rock. Between these positions there are several other shoals, with depths on them ranging from 12 to 17 feet. As these rocks are of an extremely pin-nacly nature, Southwest Rock should not be rounded nearer than $1\frac{1}{2}$ miles in a heavy sea, and in thick weather a vessel should keep in deeper water than 10 fathoms. No stranger should pass between these shoals and Southwest Rock at any time.

Eulas Ground, with 60 feet on it, lies about $4\frac{1}{2}$ miles 251° (WSW. $\frac{1}{2}$ W.) from Perley Rock.

South Point is the most southerly point or islet in the Bustard Group. From eastward and westward it was in 1886 well marked

by a single tree leaning to the northeast from the almost constant southwest winds. The bight between South Point and Southwest Rock is full of rocks awash, and some with very little water on them, and from South Point itself shoal water extends over $\frac{1}{2}$ mile southward, where there is a depth of 10 feet.

Lights—Main Light.—A fixed white light, 48 feet above water, visible 12 miles, is shown from a white square wooden structure located on a rocky islet $2\frac{1}{2}$ miles southwest of the entrance to French River.

This is also the rear light for northeast and southwest ranges.

Fog signal.—The fog signal is made on a hand horn, which answers the signals of vessels.

There is excellent boat landing at the main lighthouse in any weather.

Range Lights—Southwest Range.—Front Light, fixed white light, 27 feet above water, visible about 10 miles, is shown from a white, square, wooden structure located 65 yards 254° (W. $\frac{1}{4}$ S.) from the main (rear) light.

Rear Light.—The rear light is the main light.

These in range bearing 74° (E. $\frac{1}{4}$ N.) lead in from deep water south of Isabel Rock and north of Perley Rock.

Northeast Range—Front Light.—A fixed white light, 30 feet above water, visible about 6 miles, is shown from a white, square, wooden tower located 76 yards 43° (NE. $\frac{1}{4}$ E.) from the rear (main) light.

Rear Light.—The rear light is the main light.

These in range astern bearing 223° (SW. $\frac{1}{2}$ W.) lead up toward the entrance to French River to their intersection with the range lights (later described) shown there.

Note.—The main lighthouse, and the highest and broadest of the three, stands southward of the other two, and in approaching the Bustards from the southeast will first appear in range with the northeast or smaller light tower. After passing this range the two smaller buildings will come in range and should also be passed; finally the southwest and smaller lighthouse will come in range with the main tower, constituting Southwest Range; which should be steered for as directed.

Castle Island forms the northeastern of Bustard Rocks, being quite bare and 26 feet in height; some dry rocks extend from it in a northeasterly direction nearly 200 yards, which may be approached to 100 yards, as may the whole northwest side of Bustard Rocks.

Ridout Islands, three in number, partially wooded with scattered pines, lie 1,320 yards northeastward from Castle Island; the northwest, north, and east sides may be approached to 100 yards.

A rock with 14 feet water on it lies 880 yards northward from the north point of Ridout Islands and about 350 yards southeastward of the track into French River.

McLean Shoal, with 9 feet water over it, is situated 440 yards southward from Turnaway Rock (previously described), and is only 100 yards eastward of the intersection of the river and northeast lighthouse ranges.

Seymour Rock, 3 feet high, lies on the southeast side of the channel, into French River, and nearly 590 yards east by south from Turnaway Rock. A reef with 8 feet water over it extends 270 yards southwest, and a rock with 4 feet on it lies 150 yards northward from Seymour Rock.

Barron Rock, 3 feet high, is situated 440 yards north-northeast from Seymour Rock, being connected therewith by a bank, on which there is less than 3 fathoms. Shoal water extends northeastward 300 yards, where the depth is 12 feet. A stone, 2 feet above the water, lies 100 yards southeast from the south point of Barron Rock.

Cherokee Rock is a small stone just showing above the water and situated 590 yards east by north from the highest part of Depot Island. There is a patch with 12 feet on it, situated 350 yards southwest of Cherokee Rock, one with 3 feet water over it lying 200 yards south-southwest, and another with 6 feet on it lying 200 yards northeast from Cherokee Rock.

Depot Island, 8 feet high and at the southern termination of the continuous west side of French River, is about 200 yards long and quite narrow. It has deep water close to its channel side. From this island the northwest shore of French River runs northeastward nearly 1 mile to the lighthouse on Lefroy Island and is steep-to.

Range Lights—Front Light.—A fixed red light, 15 feet above water, visible 7 miles, is shown from a white, square, slatted tower on Lefroy Island, west side of mouth of French River.

Rear Light.—A fixed red light, 37 feet above water, visible 7 miles, is shown from a white, square tower on the east side of the river, 1,726 yards 27° (NE. by N.) from the front light.

These, in range bearing 27° (NE. by N.) in conjunction with Northeast Range, lead into the river.

In the daytime, when uncertain of the above range, the Roman Catholic Church belfry, kept just inside the southeastern extremity of Lefroy Island, affords the same lead.

Middle Reef lies with its north end (a dry stone just showing in 1888) 120 yards eastward from Lefroy Island Lighthouse. Shoal water extends from this stone 200 yards in a southwesterly direction, reducing the channel between it and the lighthouse to a width of 80 yards. A small rock, however, with 10 feet on it (in low stages there

may be 4 feet less) lies in the middle of the channel 120 feet eastward from Lefroy Island Lighthouse. The coast of Lefroy Island being quite steep—to may be kept close on board.

The best channel is southeast of Middle Reef and between it and the bank from Sabine Island, but in the absence of buoys requires great care in a deep-draft vessel, as the passage is only 100 yards wide.

Bluff Point, about 20 feet high, forms the east entrance point of the river, and 50 yards off it lies a round rock 8 feet high called Loaf Rock; shoal water extends westward 100 yards. From Bluff Point the east shore of the river runs nearly straight for 880 yards to the mouth of the creek, where will be found a depth of 10 feet of water, gradually shoaling to the bottom.

Brock Island.—From Lefroy Island the cliffy coast, from 20 to 30 feet high, runs nearly straight 1,175 yards to Brock Island, which is separated from the west shore by a narrow boat passage. This island is narrow and 150 yards long, and 100 yards southwestward of it there is a rock about 30 yards from the west shore with 3 feet water over it, while 100 yards northeastward of the island and rather nearer the west than the east side of the river there is a rock with only 1 foot of water over it, which should be carefully avoided by keeping the east shore on board.

Green Island, 4 feet high, is the northeasternmost of four small islets situated just above the upper mill and 590 yards from Brock Island. The channel is narrowed still more by a rock with 9 feet water on it lying 50 yards eastward of these islets. The channel between this rock and the eastern bank of the river is only 70 yards wide. If this obstruction is not buoyed, the eastern shore and wharf should be kept close on board. A dry rock, and one awash, lie nearly 150 yards southwestward of the largest and southwest island of the group and 50 yards from the west steep bank of the river, which is here 35 feet high.

Prominent objects.—Although little was going on in 1914 but the exportation of logs, the red fronted Roman Catholic Church with its narrow sharp belfry is conspicuous, as is also the white front and belfry of the Presbyterian Church, a little northwest of the former. The burner and chimney of the mill are also conspicuous.

Public wharf.—This is erected on the east side of the river at about 590 yards above Green Island and nearly 1.6 miles from Leroy Island Lighthouse. The wharf is 100 yards north of a rather deep indentation, called Loading Cove, from its being a convenient place in 1886 for the large vessels to take in saw logs. Sufficient water will be found at this and all the wharves in French River for deep-draft vessels. At 590 yards northward of the public wharf the river widens out, the northwest corner taking the name of MacDougal

Bay, and the banks of the river to the northeast rapidly converge to the falls 590 yards above the wharf and prevent any further navigation. A stage connects the village with railroads, about 15 miles up French River.

Directions for French River.—If from North Channel of Lake Huron pass 880 yards southward of Grondine Rock, then steer 97° (ESE. $\frac{3}{4}$ E.), which course should lead $1\frac{1}{4}$ miles southward of Emery Reef and 880 yards south of Isabel Rock. Proceed on this course until the main lighthouse comes in range with the southwest lighthouse, bearing 74° (E. $\frac{3}{4}$ N.). The latter mark, constituting southwest range, leads northwestward of Perley Rock and all the shoals off Bustard Rocks and to within 200 yards of the lighthouses.

Keep 440 yards northwest of the rocks until abreast of Castle Island, when bring the Bustard Rocks northeast range lighthouses in range astern, bearing 223° (SW. $\frac{1}{4}$ W.), and proceed with them so for $1\frac{1}{4}$ miles from Castle Island, when the river lights should be in range bearing 27° (NE. $\frac{3}{4}$ N.). After keeping the latter in range for $1\frac{1}{4}$ miles, Lefroy Island Light should be passed close to, to avoid the 10-foot rock in mid-channel, or a vessel may pass between Middle Reef and Sabine Island and mid-channel kept until arrival at destination. By following these directions a depth of not less than 24 feet was found in 1886 (in low states there may be 4 feet less).

Anchorage.—A vessel may anchor in 4 to 7 fathoms, mud bottom, under the northwest shore anywhere northeastward of Depot Island.

From the southeast, keep not less than 1 mile from Southwest Rock until the north point of Ridout Islands opens northwestward of Castle Island Rocks, bearing 65° (ENE. $\frac{3}{4}$ E.), when a vessel may haul northeastward and proceed as before directed.

From Owen Channel.—After entering Georgian Bay by the directions given, steer to pass 880 yards northwestward of Wall Island, then a 58° (NE. by E. $\frac{3}{4}$ E.) course for 40 miles will bring a vessel to within 1 mile of Southwest Rock of Bustard Islands. From the northwestern part of Lake Huron this is, in clear weather and daylight, for vessels of not too heavy a draft, a good route to French River, leading $4\frac{1}{4}$ miles northwestward of Northeast Shingle and 6 miles in the same direction from Dawson Rock, with the benefit of smoother water in the prevailing southwest winds.

From Cape Hurd Channel.—When making the entrance to Georgian Bay in daylight and fine weather, the master of a vessel, if acquainted with the locality, will find Cape Hurd Channel the most direct route to French River from the southern ports of Lake Huron. Having entered Georgian Bay by the directions given, a 35° (NE. $\frac{3}{4}$ N.) course from a position 880 yards southeastward of

the northeastern extremity of Bears Rump for 47 miles should bring a vessel to the line of the Bustard Rocks southwest range lights and 2 miles distant therefrom, passing 1 mile southeastward of Halfmoon Island South Ledge and 1,175 yards southeastward from Dawson Rock.

Caution.—This course from Bears Rump Island is not recommended in thick weather, on account of the close proximity of Halfmoon Ledges and Dawson Rock, under which circumstance a more easterly course until past the latter should be steered. If the weather is thick when approaching the Bustards, proceed very slowly after getting 12 fathoms and stop immediately at 10 fathoms until land is recognized.

Double Island, on the north coast of the Bustards, lies with the north end of the eastern and larger islands 880 yards eastward from the north point of Ridout Islands. Its north point is steep-to, and the passage eastward of it has from 4 to 5 fathoms.

Camel Rock, 5 feet high, is situated between Ridout and Double Islands, being joined to the latter by sunken rocks and a dry stone; good water may be carried in between Ridout Islands and Camel Rock.

Anchorage may be had under the north coast of Bustard Islands by steering from 200 yards off Castle Island to the same distance north of Ridout Islands. Haul round eastward of the latter midway between them and Camel Rock; pass rather nearer the north coast of the Bustards than the latter to avoid a spit from it, and anchor close under the coast with the western Double Island in range with the mouth of French River, or proceed nearly 440 yards farther eastward, where there will be still better shelter.

Bustard Islands Harbor.—The entrance to this snug little harbor and fishing station is 880 yards southeastward of Camel Rock. A depth of 15 feet may be carried in between Harbor Island and the north coast of the Bustards southward of it. When the island is passed the water will deepen to 4 or 5 fathoms mud, and the vessel's head should be turned sharply to starboard and the anchor let go in the middle of the space just sufficient for a vessel 130 feet long to swing with 25 fathoms of chain. This harbor can not be recommended to vessels drawing more than $8\frac{1}{2}$ feet water on account of two small rocks with 9 feet water on them (1886) lying 30 or 40 yards westward of the entrance, between which rocks the surveying steamer *Bayfield*, drawing over 10 feet, used to pass by marking them with buoys.

Northeast Passage.—This is the channel extending from French River to One Tree Island northward of Bustard Islands, Gull Rocks, and Frances Smith Shoal, and through which, with the assistance

of buoys and beacons, it was possible in 1886 to carry 4 fathoms of water. It is not intended that the following description of its principal dangers and directions for avoiding them should in the present unbuoyed state of the channel induce a stranger to attempt it. The directions are, first, for the purpose of assisting in the possible placing of such aids at a future day, and, secondly, to add to the local knowledge of the few men who use this passage at the present time. The distance from Byng Inlet to French River by this passage is 4 miles shorter than that south of Bustard Islands.

Dangers.—**Queens Reef**, 440 yards long east and west, with 7 feet least water on it, is situated with its western extremity 350 yards north-northeast from the north point of the eastern Double Island, the passage being between this island and the reef.

North Island is the northernmost island of the Bustards, its western side being composed of a steep bluff 35 feet high, the highest land in the group.

Tie Island, so called from the fact of tugs tying up to it with their rafts in southerly gales, lies next eastward of North Island. Northward 200 yards from the middle of this island is a patch with 15 feet over it called Minnie Rock, with 10 fathoms between them.

Hall Rock, with 12 feet water on it, lies 440 yards eastward of the last-mentioned patch and 200 yards northward of the first small island eastward of Tie Island. The passage is between Hall Rock and the Bustards, close to the north coast of which the water is deep.

Burke Shoal, with 11 feet water on it, lies 440 yards northeast from Northeast Point and 200 yards from the nearest Bustard Island, the channel being between the latter and Burke Shoal.

Gull Rocks consist of a cluster of small bare rocks covering an area about 590 yards in diameter, the highest rock being 10 feet above the water. Between Bustard Islands and Gull Rocks there is no passage for a vessel, and even for boats it is dangerous in a heavy sea.

Southeast Rock is isolated, smooth, and 8 feet above the water, situated 590 yards southeast of Gull Rocks. The line of the Dead Island range beacons passes 1,175 yards southeastward of Southeast Rock.

Perkins Rock, with 19 feet water over it and only important in connection with the channel of approach to Key Harbor, lies a little more than 590 yards southward from Southeast Rock.

Buoy.—A black spar buoy to mark this 19-foot patch is usually moored 300 yards south of it and 200 yards northwest of the Dead Island Range.

Light buoy.—A red cylindrical buoy, with a skeleton superstructure, exhibiting an occulting red light, is moored about $1\frac{1}{2}$ miles southwestward of Southeast Rock.

Black Rock is of a darkish color, quite alone, 5 feet high, and is situated rather more than 880 yards north-northwest from the highest Gull Rock. It is about 25 yards long north and south, and a spit makes out 50 yards from its north end, with which exception the water is deep all round it. The channel passes 100 to 150 yards northward of this rock.

Bagot Rock, with 11 feet on it, lies 880 yards east-southeast from Black Rock. A rock awash lies southeast the same distance from it, and a patch with 12 feet on it lies 1,175 yards southeast by east from Black Rock.

Goldwin Rock, with 8 feet water over it, lies northeast by east 1,320 yards from Southeast Rock, the vessel's track passing midway between them.

Frances Smith Shoal is a very dangerous and extensive rocky bank, on the north side of which are two patches of dry stones 1 foot above the surface (1886). The shoal, with depths varying from a few inches to 12 feet, extends over $1\frac{1}{2}$ miles in a northwest and southeast direction and over 1 mile transversely. Its northwest side is separated from Southeast Rock by a passage 1 mile wide with irregular depths exceeding in places 20 fathoms. Several banks with from 3 to 4 fathoms on them lie southwestward of Frances Smith Shoal, the outermost one, with $3\frac{1}{2}$ fathoms on it, lying $4\frac{1}{2}$ miles southeast from south point of Bustard Islands. In this locality in thick weather passing vessels should not approach Frances Smith Shoal to a less depth than 8 fathoms.

Buoy.—To facilitate the navigation of the channel of approach to Key Harbor a red spar buoy usually marks the northwestern extremity of Frances Smith Shoal. The buoy lies 590 yards southeast of the line of the Dead Island Range beacons and 142° (SSE. $\frac{1}{2}$ E.) from Southeast Rock.

One Tree Island takes its name from a single umbrella-shaped elm tree (growing in 1886, and it is to be hoped no thoughtless person will cut down) and is situated 4 miles southwestward from Key Harbor at the mouth of the inlet formerly known as the Key.

Solitary Rock, 6 feet high, lies 880 yards westward of the last-mentioned island, being connected therewith by shoal water. Its isolation renders it conspicuous, and consequently serviceable in pointing out the entrance to Northeast Passage from the south. A few stones extend from its north end, and a rock just level with the surface lies 440 yards west-northwest from Solitary Rock. Very shallow water also extends 590 yards west and 440 yards southwest from the same. Two distinct patches also lie west by north 880 yards, and west-northwest 1,175 yards, respectively, from Solitary Rock, the first called Dingy Rock, having 11 and the latter 10 feet over it (1886).

Murray Rocks are a group of small islets and rocks situated with the southeastern and largest islet, 10 feet high, which has now the distinctive name of Cherry Island, lying nearly $1\frac{1}{4}$ miles north by east from Solitary Rock and 300 yards northwestward from Elgin Rock, an islet of similar size, height, and character. From 6 to 7 fathoms will be found between the latter and Cherry Island, forming part of the channel to Key Harbor for light-draft steamers, to be again alluded to.

Britton Shoal, with 4 feet water over it in 1886, is situated at the northwest end of Murray Rocks, and 200 yards southeast of the junction of the Dead Island, and Keefer Island beacon ranges, used in the approach to Key Harbor.

Spar buoy—Murray Bend.—Northeast 100 yards from this shoal is placed a red spar buoy.

Ruel and Bray Reefs, with 18 and 19 feet water over them, lie respectively west 880 yards and southwest by south 330 yards from the above-mentioned junction.

Buoys.—The former is marked by a black spar buoy 270 yards northwest, and Bray Reef with a red spar buoy 150 yards southeast of the line of the Dead Island Range.

Counts Bank—Buoys.—Counts Bank, with 16 feet of water over it, is marked by a red spar buoy lying 880 yards eastward of the above junction. A black spar buoy is moored 270 yards north of the Keefer Island Range and 590 yards eastnortheast of the above junction.

Directions—Northeast Passage from French River.—Steering for the Bustard Rocks Lighthouses in range 223° (SW. $\frac{1}{4}$ W.), alter the course for the northern extremity of Bustard Island when it touches the south point of Dead Island bearing 105° (ESE.); steer for it thus, passing close to the north point and from 50 to 100 yards off the north coast of the Bustards. Leaving these islands, steer to pass from 100 to 150 yards northward of Black Rock. Thence steer 105° (ESE.) for 880 yards to pass north of Bagot Rock with 11 feet water (on which should be a buoy); after passing the latter, steer 152° (S. by E. $\frac{1}{4}$ E.) the same distance, when a vessel should be about 590 yards northeast of Southeast Rock, and, heading for One Tree Island, should have the elm tree on it right ahead and Black Rock right astern and about its own breadth open north of Bustard Islands.

With the objects in this position, a vessel should steer 124° (SE. $\frac{3}{4}$ E.) for One Tree Island, 2 miles, passing between Frances Smith Shoal and Murray Rocks with not less than 4 fathoms water, until the high southeast Murray Rock bears 55° (NE. by E. $\frac{3}{4}$ E.). The vessel's head should then be turned southward to pass out between Frances Smith Shoal and the reef from Solitary Rock, steering

176° (S. $\frac{3}{4}$ W.) until rather more than 1 mile outside of Solitary Rock, when the shoal water will be passed and vessel may haul south-eastward.

A buoy should be placed on the southwestern extremity of the bank from Solitary Rock and brought to bear 176° (S. $\frac{3}{4}$ W.) before turning off the One Tree Island and Black Rock Range; a course to pass close west of it will lead also eastward of Dingy Rock, on which, as before stated, there is 11 feet (1886). After passing the reef from Solitary Rock, two patches will be passed over, the northernmost, Cross Ledge, at 590 yards, has 15 feet least water on it, and the other at a little under 1 mile, 21 feet. From the southern patch a 127° (SE.) course for 8 miles will bring a vessel to the line of the Byng Inlet Range lights.

Key Harbor.—The wharves of this Canadian National Railroad Port are built on the northern entrance point of an inlet known on the old chart as the Key, hence its present name. Key harbor is equidistant between the mouths of French River and Byng Inlet, being about 6 miles distant from each in an air line. It lies 3 miles north-eastward of the nearest part of this line. The depth at the loading wharf is 22 feet (in low stages there may be 4 feet less), but, on account of the limited turning room, local assistance is necessary in berthing a vessel.

The channel of approach to Key Harbor with a depth of 22 feet (in low stages there might be 4 feet less) lies north of three principal groups of islets known as Murray Rocks, Keefer Island, Bigsby Island, and Mann Island, and southward of Dead, Dokis, Wedge, Germain, and Pine Islands.

Keefer Island, consisting of half a dozen islets, the highest of which is 8 feet high, is situated 1 mile northeastward from Murray Rocks. A shallow bank with as little as 4 feet water extends 440 yards northward of the group and to within 250 yards of the line of the Wedge Island beacons.

Beacons.—On the highest Keefer Island is erected a white pyramidal beacon, and on a southern islet of the Bigsby Island Group is placed the back beacon of this range, rectangular in shape, painted white. These in range bearing 92° (E. $\frac{1}{4}$ S.) lead from Dead Island Range to Wedge Island Range.

Bigsby Island is a larger group, 14 feet in height, lying 880 yards northeastward of Keefer Island. From its northern part shoal water extends toward the range 130 yards.

Buoy.—A red spar buoy, marking a shoal of 13 feet, is placed 300 yards northeast from the north point of Bigsby Island.

Alwin Rock—Spar buoy.—Westward 760 yards from the north point of Bigsby Island and close southeast of the Wedge Island

Range is moored a spar buoy painted red, marking the north edge of Alwin Rock with a depth of 19 feet.

A black spar buoy marking a 20-foot patch lies 230 yards west of this buoy and 80 yards northwest of the same range line.

Hanna Bank, 300 yards long in a north-northeast direction, with 14 feet water on it, lies between Bigsby and Dokis Islands and its southwest end is marked by a black spar buoy moored close northwest of the Wedge Island Range line.

Mann Island, 18 feet high, is the largest of a group of islets lying east of and almost connected with the Bigsby Island Group.

Spar Buoy.—From the northern extremity of Mann Island shoal water makes out 200 yards toward Wedge Island and is marked by a spar buoy painted red lying 300 yards southward from Wedge Island Beacon and 100 feet south of the Dokis Island Range.

Phillips Shoal—Spar buoy.—This isolated shoal, nearly 200 yards long in a northeast direction, with 15 feet water on it, is marked by a red spar buoy moored in 18 feet of water a little south of the same range and 700 yards westward of the Canadian National Railroad Co. loading wharf. As this buoy is very close to the Dokis Island Range, it will be necessary to open the range to the northward in passing.

Key Harbor Wharf—Buoys.—A wharf for the loading of iron ore and for the unloading of coal and other materials is built from the north entrance point of Key Inlet 1,100 feet in a westerly direction and at which there is a depth of 22 feet (in low stages there may be 4 feet less). Two red spar buoys marking the shoal bank on the south side of the harbor lie, respectively, southwest 150 yards and southeast 100 yards from the outer end of the loading wharf.

Two black spar buoys marking the southern edge of shoal water from the Pine Island Group are placed 100 feet northward of the line of the Dokis Island Range beacons and westward of the loading wharf 170 yards and 440 yards, respectively.

Dead Island, so called from the fact of its having been in olden times the burial place of the Indian tribes frequenting these parts, is situated 3 miles westward of Key Harbor. This dark wooded island, including the small islets 5 feet high close south of it, is nearly 1 mile long north and south, with a maximum breadth of 440 yards.

Beacons.—A white pyramidal beacon is erected on the west coast of Dead Island, which in range with a white rectangular beacon on Lash Island, distant 700 yards 58° (NE. by E. $\frac{1}{4}$ E.), leads from the open bay to the intersection of the Keefer Island Range.

Dead Island Reef—Buoy.—Shoal water extends 330 yards southward from the islets close southward of Dead Island and 60 yards northward of the Keefer Island Range and is marked by a black spar buoy.

Wicksteed Rock, with 19 feet water on it, is a small isolated shoal over 590 yards south-southeast from the islets above mentioned.

Buoys.—The north edge of Wicksteed Rock is marked by a red spar buoy. A spar buoy, painted red, is moored 230 yards east of Wicksteed Rock and close south of the intersection of Keefer and Wedge Island Ranges.

North of both these ranges, and lying 230 yards northwest and northeast, respectively, from the spar buoy just mentioned, are moored two black spar buoys.

Pratt Reef—Buoy.—Situated nearly 880 yards northeast from the southern end of Dead Island, is an islet 9 feet high, called Pratt Island. A third of a mile south-southeast from Pratt Island and 80 yards northwest of the Wedge Island Range is placed a black spar buoy marking the southern extremity of Pratt Reef, with 11 feet on its southern extremity.

Dokis Island is situated with its south end $1\frac{1}{4}$ miles east-northeast from the south point (islets) of Dead Island, and between them, runs in the eastern mouth of French River, called from that circumstance, East Branch. The ground of Dokis Island near the south end is 10 feet above the water; and its steep south fall, together with its high pines, renders the island a conspicuous feature.

Beacons.—Near the southern extremity of Dokis Island are erected two beacons 170 yards apart, the eastern one, a pyramid, and painted white; the other rectangular, and painted white. These beacons in range bearing 276° (WNW. $\frac{1}{4}$ W.) lead from the Wedge Island Range to Key Harbor Wharf.

Anchorage in 10 to 12 fathoms can be had 350 yards southeast of the front beacon and 150 yards northwest of the Wedge Island Range.

Wedge Island, 10 feet high, is the highest of a small group of four islets on the north side of the buoyed channel, and nearly 1 mile west-northwest from the wharf.

Buoy.—A shallow bank extends 100 yards southward and 150 yards southwest from Wedge Island, and in the latter position close north of the Dokis Island Range is placed a black spar buoy.

Beacons.—On Wedge Island is built a white pyramidal beacon, and on Germain Island bearing 59° (NE. by E. $\frac{1}{4}$ E.) nearly 880 yards from it is erected a white rectangular beacon. These beacons in range lead from the Keefer Island to the Dokis Island Range.

Passage southeast of Murray Rocks.—A light-draft steamer from the south bound to Key Harbor, may with local acquaintance, shorten the distance to Key Harbor and have smoother water by following the directions now given:

Entering Northeast Passage from the south soon after passing the shoal from Solitary Rock, and also Dingy Rock, the southeast

point of Dokis Island will be seen to come in range with the southeast Murray Rock (Cherry Island) bearing 37° (NE. $\frac{1}{2}$ N.).

Steer for them thus with not less than 16 feet water. Pass close southeast of Cherry Island—the water is deep—and thence steer 29° (NE. $\frac{1}{2}$ N.) for the west side of Dokis Island, steaming slowly and keeping the lead going for a little more than 1 mile, when Keefer Island with (in 1886) two conspicuous trees upon it, will be 590 yards on the starboard beam. Continue the same 29° (NE. $\frac{1}{2}$ N.) course for another 590 yards, taking care to pass northwest of the 4-foot rock lying 440 yards north of the Keefer Island group, when the Wedge Island Range beacons should be in range bearing 58° (NE. by E. $\frac{1}{2}$ E.) and may be steered for as before directed.

Directions for Key Harbor.—If, from the southern or western part of Lake Huron, having entered Georgian Bay by the directions already given, a 42° (NE. $\frac{1}{2}$ E.) course from a position 880 yards southeastward of the northeastern extremity of Bears Rump for $48\frac{1}{2}$ miles, should carry a vessel to the entrance light buoy in the approach to the channel leading to Key Harbor.

From the northwest part of Lake Huron a vessel of not too heavy draft may enter Georgian Bay by Owen Channel, and having arrived 880 yards northwestward of Wall Island Shoal should steer 64° (ENE. $\frac{1}{2}$ E.) for the entrance light buoy 44 miles.

At about mid-distance a vessel will pass near Riley Patch of Grand Bank, and on which there has since the survey been reported a depth of 18 feet.

From the entrance to Collingwood Harbor, the course and distance to the same entrance light buoy is 341° (N. by W. $\frac{1}{2}$ W.) 98 miles. This course will pass $4\frac{1}{2}$ miles southwest of the Western Islands dangers; the same distance from Seguin Bank Light Buoy and 1.3 miles in the same direction from Kennedy Bank Light Buoy which ought to be seen before proceeding farther. For a vessel from Owen Sound, the course and distance from a position 880 yards eastward of Griffiths Island Lighthouse to the entrance light buoy is 0° (N. $\frac{1}{2}$ E.) 69 miles. The best time to approach the shore is after 10 a. m. when the sun lights up the shore and the white beacons.

In thick weather, when approaching the entrance buoy, a vessel should not shoal to less than 10 fathoms, nor at night bring Bustard Rocks main light to bear westward of 329° (NNW.) until the entrance buoy is seen.

Having made the entrance light buoy which is moored on the line of Dead Island Range beacons, steer for the beacons bearing 58° (NE. by E. $\frac{1}{2}$ E.) a little over 3 miles to Britton Shoal (Murray Bend) spar buoy. This buoy should be rounded close north of, and the Keefer Island Range beacons in range bearing 92° (E. $\frac{1}{2}$ S.), steered for, until up to the Wicksteed Reef spar buoy $1\frac{1}{2}$ miles. From this

buoy a vessel will steer on the range of Wedge Island beacons 59° (ENE.) for about 2 miles, or just before Mann Island Reef spar buoy is on the starboard beam. On the last course a vessel will have passed close north of Alwin Rock spar buoy. A vessel should now haul to starboard on the range of Dokis Island beacons in range astern bearing 277° WNW. $\frac{1}{2}$ W.) and steer for the wharf, distant 1 mile, 96° (ESE. $\frac{1}{2}$ E.), passing close northward of Phillips Shoal spar buoy.

Caution.—The line of the Wedge Island beacons passes very close northwest of Alwin Rock and southeast of Hanna Bank, and caution should be used accordingly. As the three changes of range are unavoidably rather abrupt, care should be taken to put the helm over in good time.

Beresford Island is a small islet 12 feet high with a few round, stunted bushes growing on it, lying $1\frac{1}{4}$ miles southeastward of One Tree Island.

Salisbury Island is situated south-southeast 1,320 yards from Beresford Island; it is 9 feet high, 300 yards long north and south, and quite narrow. A cluster of dry rocks extends 880 yards in a south-west direction from the line joining these two islands.

Zachary Rock, with 1 foot water over it, lies nearly 880 yards southwest from the south point of Salisbury Island, and $2\frac{1}{2}$ miles southeastward from Solitary Rock.

Champlain Island, 1,320 yards long, with an average breadth of 300 yards, lies 1,175 yards from the main shore, and forms the southeastern and largest island of the group described. It is low, wooded, and indented with numerous small coves, and its northwestern extremity is 1,320 yards east from Salisbury Island, the space between the latter and Champlain Island being thickly studded with low, dry rocks and shallow spots. The southwestern extremity of Champlain Island is composed of a cluster of small, dry rocks, 440 yards southwest of which lies

Gladstone Island.—This bare rock, being 10 feet high, is rendered rather a conspicuous feature; rocks, dry and sunken, lie off its south and west sides a quarter of a mile, and a sunken rock with 15 feet over it is situated west-southwest, a little over one-third of a mile from the south point of this island. A boat channel exists between Gladstone and Champlain Islands. A rock with 12 feet over it lies south-southwest 880 yards from the south point of Gladstone Island.

Kantos Point is a portion of the mainland 1.3 miles southeastward of Henvey Inlet, and between this point and Champlain Island is a passage for small tugs and boats, which for smooth water run through inside the group of islands recently described.

Flat Rock applies to the larger and western of two bare islets 9 feet high, and lying well outside anything else offers a good mark for recognizing this portion of the coast. Shoal water extends 300 yards southward from this rock, and to avoid the dangerous patches lying northwest and southeast of Flat Rock, the south point should not to be brought to bear southward of 99° (ESE. $\frac{1}{4}$ E.), or westward of 324° (NNW. $\frac{1}{4}$ W.). Flat Rock lies nearly $1\frac{1}{2}$ miles south-southeast from Gladstone Island.

Potvin Point, although really a small, low, wooded island, and the southwesternmost of the group, is situated nearly 2 miles eastward from Flat Rock, and shoal water extends from it in every direction for 1 mile.

Byng Inlet is a long and narrow arm of Georgian Bay situated 17 miles southeast from French River. From Clarks Islands the inlet runs in a general easterly direction $3\frac{1}{4}$ miles to the Canadian Pacific Railroad Coal Wharf on the north side of the inlet and close east of the mouth of Still River. By a dredged channel a vessel in 1915 could carry to this wharf a depth of 19 feet, corresponding to 579 feet above mean tide level at New York.

The portion of the village on the north side of the inlet and immediately west of the mouth of Still River is known as Byng Inlet north, but the main village is situated on the south side opposite the mouth of Still River and the Canadian Pacific Railroad Wharf. The population in 1914 was estimated to be about 800.

The railroad station of the Sudbury-Toronto Branch of the Canadian Pacific Railroad is about 2 miles from the village, connection with the trains being made by stage. Graves, Bigwood & Co. own a large recently constructed sawmill and a box factory and a planing mill; the same firm also owns a large departmental store. At their wharf on the north side, at which there is a depth of 20 feet at the above level, the Canadian Pacific Railroad Co. landed about 450,000 tons of coal in 1913, principally from Cleveland, United States, for distribution along their line.

Gereaux Island, situated $2\frac{1}{4}$ miles southwestward of the mouth of Byng Inlet, lies on the southern side of the entrance channel.

Gereaux Island Light, fixed white, 49 feet above water, visible 12 miles, is shown from a white square wooden structure on the northern end of the island.

Fog signal.—The fog signal is made on a hand horn, which answers the signals of vessels.

Range Lights—Front Light.—A fixed red light, 34 feet above water, visible 8 miles, is shown from a white square wooden structure on the mainland, south side of entrance channel, 1,320 yards 53° from Gereaux Island Lighthouse.

Bear light.—A fixed red light, 60 feet above water, visible 8 miles, is shown from a white square wooden structure 507 yards 75° (E. $\frac{1}{2}$ N.) from the front light.

These in range, bearing 75° (E. $\frac{1}{2}$ N.), lead in not less than 4 fathoms to the intersection of the Clark Islands Range beacons.

Clark Islands, 36 feet high, lie in the mouth of the inlet, with a passage on each side of the group, but that north of them (called from that circumstance North Channel), leading for 3 miles between dangerous shoals, could not be used without it were carefully marked with large buoys. This done, 12 feet (at low stages there might be 4 feet less) might be carried in by light-draft craft and a saving of $1\frac{1}{4}$ miles effected if approaching from the northwest.

Day beacons.—Upon the southeast side of the largest and northeastern of Clark Islands are erected three beacons painted white, being known as outer (southwest), middle, and inner (northeast) beacon.

Outer in range with middle beacon bearing 51° (NE. by E. $\frac{1}{2}$ E.) lead in from the line of the Byng Inlet Range Lights. Inner and middle beacons in range, bearing 256° (W. $\frac{1}{2}$ S.) astern, lead through the dredged cut between Clark Islands and Pine Tree Point.

Buoys.—Marking the edge of a shoal extending southeast from the southwestern of the Clark Islands is placed a black spar buoy. A little northeast of it but on the southeast of the channel are moored two red spar buoys.

Macnab Rocks are a cluster of small dry rocks with a maximum height of 6 feet lying southwest of Clark Islands and separated therefrom by a passage 250 yards in breadth through which 12 feet (in low stages there may be 4 feet less) may be carried by those locally acquainted.

Keystone is a rock with 1 foot water over it in 1886, but $1\frac{1}{4}$ feet out of the water in 1914, lying nearly midway between Macnab Rocks and the main shore, narrowing the ship channel to 300 yards.

Buoy.—A black spar buoy is placed in $3\frac{1}{4}$ fathoms 100 yards southeast of Keystone.

Burton Bank extends from Macnab Rocks in a southwesterly direction $1\frac{1}{4}$ miles and westward nearly 2 miles. It is a very shallow and dangerous bank and should be carefully avoided by not standing into less than 10 fathoms until the range lights are in line. The sea breaks heavily on this bank in the strong prevailing southwest winds.

North Channel, before mentioned, passes between this bank and the shoal water from Potvin Point.

Buoys.—A black spar buoy is moored in 20 feet close southward of a 20-foot patch near the southwestern extremity of Burton Bank;

also a red spar buoy is placed about abreast this buoy on the edge of the shoal water and 300 yards south of the range.

Duffy Island, low, flat, and about 200 yards in diameter, lies 880 yards southwest of Gereaux Island Lighthouse.

Old Tower Rocks, two in number, are separated from Duffy Island by a clear good passage for boats, 150 yards wide. The northwestern rock is easily distinguished by the stone foundation of the old lighthouse, still standing 4 feet above the top of the rock, or 12 feet above the water (1915).

A rock, awash, lies 100 yards northwest of the ruin of this old tower, and one with 4 feet water on it lies 590 yards west by north from Gereaux Island Lighthouse.

Buoy.—A red spar buoy is moored about $\frac{1}{4}$ mile northeast from this spot, about the same distance northwest from Gereaux Island Lighthouse and 200 yards south of the range.

A patch with 5 feet water over it is situated 1.1 miles westward from Gereaux Island Lighthouse; and from this patch rocks dry and awash, and some with a few feet of water on them, extend eastward and southeastward.

Buoy.—A red spar buoy is moored northeast from this patch and nearly opposite Burton Bank black spar buoy.

Maganatawan Ledges extend in a westerly direction about 2.7 miles from Duffy Island, the outer patch with 15 feet over it (and in low stages there may be 4 feet less), bearing 256° (W. $\frac{1}{4}$ S.) about 2.8 miles from Gereaux Island Lighthouse.

Buoy.—A red spar buoy is placed 350 yards west by north of this spot, just outside 21 feet water.

A rock with 9 feet on it bears 252° (W. $\frac{1}{4}$ S.) about 2 miles from Gereaux Island Lighthouse.

Buoy.—Northwest 660 yards from this 9-foot rock and 100 yards south of the light range is placed a red spar buoy.

A rock, awash, is situated $2\frac{1}{4}$ miles 233° (SW. by W. $\frac{1}{4}$ W.) from the lighthouse.

Light and whistle buoy.—A cylindrical black and white vertically striped buoy, showing an occulting white light, is moored in 54 feet about 1,320 yards west of Maganatawan Ledges.

Fog signal.—A whistle is sounded by the action of the waves.

Clark Islands to Byng Inlet Village.—On the south side of the inlet and southeast of the eastern extremity of the northeastern of Clark Islands is the mouth of a creek called Blind Channel or Wilcox Cove, northward of which a ship channel $\frac{1}{4}$ mile long and 100 feet wide with depth of 19 feet (at low stages) has been dredged and marked on the south side by three red and the north side by four black spar buoys.

Pine Tree Point beacons.—Pine Tree Point is a projection on the north shore of the inlet 700 yards eastward of Clark Islands, and on it are erected two triangular white beacons 78 yards apart, which in range bearing 76° (E. $\frac{1}{2}$ N.) lead through the dredged channel just mentioned.

A little eastward from Pine Tree Point is another dredged cut, about the same length, width, and depth, marked by three red and three black spar buoys.

Old Mill Island—Buoy.—The west end of this island is situated 2 miles eastward from Clark Islands. A black spar buoy marks Robinson Shoal, a 17-foot rock lying 200 feet south of the western extremity of Old Mill Island.

Rabbit Narrows.—Rabbit Island, situated close eastward of Old Mill Island, and 1,320 yards westward of Byng Inlet village, is $\frac{1}{4}$ mile in length. The ship channel between the island and south shore is named Rabbit Narrows, the narrowest and western part being a little crooked and only 100 feet wide.

Beacon—Buoys.—On the south side of the narrows, and abreast the west end of Rabbit Island, is erected a red beacon. The dredged channel is marked on the Rabbit Island side by three black and on the south side by three red spar buoys.

Range beacons.—Three pairs of white range day beacons have been erected on the south shore to mark the channel in the vicinity of Old Mill and Rabbit Islands.

Robinson Shoal range beacons.—On the south shore abreast the west end of Rabbit Island are erected a pair of range beacons 173 feet apart, which in range bearing 93° (E. $\frac{1}{4}$ S.) lead through the channel south of Robinson Shoal to the intersection of Rabbit Narrows Range beacons.

Rabbit Narrows range beacons.—On the south shore abreast the middle of Old Mill Island are erected a pair of beacons 150 feet apart, which in range bearing 256° (W. $\frac{1}{4}$ S.) lead through Rabbit Narrows Channel from their intersection with Robinson Shoal Range to their intersection with Rabbit Channel east range beacons.

Rabbit Channel east range beacons.—On the south shore abreast the middle of Rabbit Island are erected a pair of beacons 342 feet apart, which in range bearing 243° (WSW. $\frac{1}{4}$ W.) lead through Rabbit Channel east from their intersection with Rabbit Narrows Range.

From Rabbit Island Narrows to Byng Inlet Village and the Canadian Pacific Railroad Wharf the water is deep, but apt to be obstructed by rafts, and masters of vessels must guard against being set on shore by them.

The berthing portion of the railroad wharf is 500 feet long and the village opposite has a wharf 200 feet in length. Both have a depth of 19 feet at low stages, and, to allow a long vessel to turn, the whole space between them has been dredged to that depth.

Directions.—The course and distance from a position 880 yards southeast of the northeast end of Bears Rump Island, to the light buoy, moored in 9 fathoms $1\frac{1}{2}$ miles westward of Maganatawan Ledges, is 54° (NE. by E. $\frac{1}{2}$ E.) 48 miles.

From the northwest part of Lake Huron a vessel may enter Georgian Bay by Yeo Channel, and, with the northeast points of Yeo and Lucas Islands in line abeam, the course and distance to the same light buoy is 66° (ENE. $\frac{1}{2}$ E.) $54\frac{1}{2}$ miles.

From Owen Sound the course and distance from a position 880 yards east of Pyette Point ($3\frac{1}{2}$ miles northeast of Presqu'isle) to the light buoy is 5° (N. by E.) $67\frac{1}{2}$ miles.

From Killarney in a light-draft vessel the course and distance from the north point of Green Island to the light buoy is 113° (SE. by E. $\frac{1}{2}$ E.) $30\frac{1}{2}$ miles. This course leads about 3 miles southwest from Grondine Rock and about 6 miles from Bustard Rocks Lighthouses, and after the first $3\frac{1}{2}$ miles from Green Island a vessel should not have less than 10 fathoms.

From North Channel of Lake Huron (or Killarney in a heavy draft vessel), pass close northward of Gull Island, the course and distance from which to the light buoy is 109° (SE. by E. $\frac{1}{2}$ E.) 27 miles.

When going the reverse way in thick weather or at night a good check on the distance run and the proximity of Gull Island (low and difficult to make out), is a cast of the lead on Seven Fathom Bank lying directly on the course, distant $4\frac{1}{2}$ to 5 miles from Gull Island, and between which there is a depth of 17 to 19 fathoms, the former depth being found close to Gull Island.

From French River a course 130° (SE. $\frac{1}{2}$ S.) from a position $1\frac{1}{2}$ miles southwest from Southwest Rock of the Bustards in range with the lighthouse, for 15 miles, should lead a vessel to Maganatawan Ledges Light Buoy.

From the southeast the course and distance from a position 1 mile west of Black Bill Islands to the light buoy, passing 1,320 yards southwest of Morden Rock Buoy, is 333° (N. by W. $\frac{3}{4}$ W.) $16\frac{1}{2}$ miles.

Proceeding into Byng Inlet.—Having arrived at the light buoy, keep the range lights in range bearing 75° (E. $\frac{1}{2}$ N.), passing northwestward of three red spar buoys and southeast of the one black spar buoy marking Burton Bank. When 880 yards west of the front range light, the Clark Islands outer and middle beacon should be in

range bearing 51° (NE. by E. $\frac{1}{2}$ E.) and while on this range the Clark Islands inner beacon is a little to the right of the range.

Having passed the red spar buoy moored 350 yards southwestward of the outer beacon, keep in mid channel until abreast the inner beacon. This and the middle Clark Islands beacon should now be kept in range astern, bearing 256° (W. $\frac{1}{2}$ S.), and Pine Tree Point beacons in range ahead bearing 76° (E. $\frac{1}{2}$ N.). When eastward of the six buoys marking the edges of the dredged cut, keep in mid channel and pass between the two red buoys and the three black buoys marking the edges of the dredged channel close eastward from Pine Tree Point.

Proceed now in mid inlet for about $1\frac{1}{2}$ miles to Rabbit Narrows. When $\frac{1}{4}$ mile west of Old Mill Island, Robinson Shoal Range beacons should be held in range 93° (E. $\frac{1}{2}$ S.) to clear Robinson Shoal. Passing about 15 yards south of the black spar buoy marking this shoal and when a little past the front range beacon bring Rabbit Narrows Range beacons in range astern bearing 256° (W. $\frac{1}{2}$ S.) and the ship heading 76° (E. $\frac{1}{2}$ N.). Hold this range passing between two black and two red spar buoys until the alignment of the Rabbit Channel east beacons is reached astern bearing 243° (WSW. $\frac{1}{4}$ W.) and ship heading 63° (ENE. $\frac{1}{4}$ E.). This range leads between a red and a black spar buoy, having passed which there is a good wide channel with plenty of water for 1,175 yards to the wharves.

Anchorage.—A steamer overtaken by darkness or a sailing vessel waiting for a fair wind will find excellent anchorage in 4 fathoms over mud, between MacNab Rocks and the southwestern extremity of Clark Islands, dropping anchor with the northeastern extremity of MacNab Rocks bearing 329° (NNW.) and the southeast sides of Clark Islands touching the southeast shore of the inlet, bearing about 65° (ENE. $\frac{1}{4}$ E.).

Danger angle.—To those conversant with the use of a sextant, as long as the angle subtended by Gereaux Island Lighthouse and the center of Red Rock is less than $38\frac{1}{2}^{\circ}$ a vessel will be 880 yards outside or westward of Maganatawan Ledges. To the surveying steamer, in the absence of buoys in 1886, this only sure means of ascertaining the distance from the ledges before taking or leaving the line of the range lights, proved very convenient.

In thick weather or at night, unless certain of being on the line of the range lights, a vessel should not stand into less than 12 fathoms.

Red Rock, 14 feet high and about 120 yards in diameter, lies 2.3 miles southward from Gereaux Island Lighthouse.

McHugh Rock, round, flat, and 6 feet high, is situated 880 yards northwest from Red Rock, while Norgate Rock, the same height above the water, lies 590 yards southward of the same. The latter is

440 yards long, in a northwest and southeast direction, and, like the other two, is surrounded with shoal water.

Sophia Rock, with 4 feet water over it, lies 279° (WNW. $\frac{1}{2}$ W.) $1\frac{1}{2}$ miles from Red Rock.

Sarah Rock, with 7 feet, a little over 1 mile 242° (WSW. $\frac{1}{4}$ W.) from Red Rock.

Augusta Rock, with 5 feet on it, $1\frac{1}{2}$ miles 202° (SSW. $\frac{3}{4}$ W.) from Red Rock.

A rock, with 11 feet on it, lies $1\frac{1}{2}$ miles 213° (SW. $\frac{3}{4}$ S.) from Red Rock.

The shore is especially foul between Duffy Island and Red Rock, the prevailing westerly winds making navigation uncomfortable for a boat. The latter can, however, avoid the shallow and exposed water by taking the well-sheltered boat passage inside the reefs as far as Naishcotyang River.

Wreck.—About midway between Morden Rock and Maganatawan Ledges Light Buoy and a little east of their alignment lies a wreck of a vessel. Seven fathoms was the least water found over the hull. A portion of a broken spar painted black with a white flag attached shows $4\frac{1}{2}$ feet above the water.

Morden Rock is a dangerous obstruction with 8 feet water over it (1886) lying $2\frac{1}{2}$ miles 236° (SW. by W. $\frac{3}{4}$ W.) from Red Rock. This danger lies 3.6 miles southeastward from the light buoy moored on the line of Byng Inlet Range Lights.

Buoy.—A spar buoy with horizontal black and white bands is usually moored 100 yards southwest of Morden Rock; vessels should pass southwest of this buoy.

Imperial Bank, with $5\frac{1}{2}$ fathoms over it, lies $1\frac{1}{2}$ miles south-southwest from Morden Rock, and the track from the Black Bills to Byng Inlet passes between them. Another bank with $6\frac{1}{2}$ fathoms on it lies 1 mile westward of the Morden Rock.

In thick weather a vessel should not shoal her water to less than 12 fathoms in the vicinity of Morden Rock, or indeed anywhere between Byng Inlet and Point au Baril.

Raft Island, which with the other islands about it form a kind of point, lies 1,175 yards east-southeast, from Norgate Reef, and with the assistance of buoys a small steamer might for lumbering or other purposes, get in as far as this, and perhaps east of Raft Island.

Bouchier Islands are another group 880 yards southeast of Raft Island, and, as before remarked, the whole form a kind of point.

Laird Rock, small and 1 foot high, lies nearly 1 mile southward from the southeastern extremity of Norgate Reef.

Head Island is $5\frac{1}{4}$ miles southeastward of Duffy Island. It is supposed by some to take its name from the resemblance of the

northeast island of the three to a bald headed man. The island is 26 feet high, and the top being bare, with pines growing around the sides, it is quite probable that the name was suggested by this bald appearance. This clear spot and gray rock, together with the high bent pines on the southern and largest island make it conspicuous as marking the vicinity of Naishcotyang River.

Garnet Rock, 3 feet high, **Wolseley Rock**, 2 feet high, and **Mercier Rock**, 1 foot high, lie, respectively, northwest 1,320 yards, west-northwest 590 yards, and south-southwest, the latter distance from the south point of Head Island. A spot with 15 feet on its lies $1\frac{1}{4}$ miles westward from the same. In fine weather a boat may squeeze through between Head Island and the shore.

Naishcotyang River.—The mouth of this river is situated 1 mile southeastward from Head Island, and although there are innumerable sunken rocks in this locality, there exists a very narrow channel, by which with the assistance of buoys, 15 feet (1886) can be carried in by keeping close to some dry rocks off the southeast entrance point. The river from the entrance takes an easterly direction $3\frac{1}{4}$ miles, where it is joined by Charles Inlet the entrance to which from Georgian Bay is $2\frac{3}{4}$ miles southeastward from Head Island. A considerable quantity of logs is brought down Naishcotyang River.

Black Rock is a darkish rock 5 feet high situated nearly 1,320 yards southward of the mouth of Naishcotyang River, and a little more than 1 mile northwestward of the entrance to Alexander Inlet; it is surrounded by shallow water.

Athabasca and Alberta Rocks, with less than 6 feet water on them, lie westward 1 mile, and 1,320 yards, respectively, from Black Rock.

Alexander Inlet is a little harbor 2 miles southeastward of the mouth of Naishcotyang River. It is also 8 miles southeast from Gereaux Island Lighthouse of Byng Inlet, 6.6 miles northwestward of Point au Baril Harbor. Excellent anchorage in 3 fathoms over mud can be had in Alexander Inlet with perfect shelter from all winds, and 13 feet (at low stages there may be 4 feet less) can be carried in by bringing the south point of North Reef in range with north side of Meneilly Island, bearing 102° (ESE. $\frac{1}{4}$ E.). For the use of the surveying steamer *Bayfield* two beacons were erected upon this range, but without such aids or buoys no stranger should attempt to enter.

The Sisters are a patch of rocks awash, and similar to a cluster known as **Brothers**, both patches lying 300 yards westward of the entrance, the channel being between them. These shoals break heavily in a strong westerly breeze, more particularly the Brothers, rendering the passage anything but inviting, but the latter are steep-to on the north side.

Sylvia Rock, with 5 feet on it, lies on the north side of the channel near the entrance, which is between two clusters of rocks 3 or 4 feet high, the northern point being known as North Reef and the southern as South Reef. Sylvia Rock lies nearly 100 yards southeast from North Reef. It is a very small rock and should be buoyed by anybody frequenting this port. A glance at the enlarged plan will show that proceeding up the inlet in mid-channel there is no danger in the way excepting Snap Rock (small and generally showing on the south side of the passage) until abreast of the boat channel into Charles Inlet.

Harbor Reef is the worst obstruction in the harbor, and consists of several shoal rocks with 1 to 4 feet water over them, reaching from the north shore to about the middle of the passage.

Dart Rock, the top of which in 1886 was level with the surface of the water, is on the south side of the channel and almost abreast of Harbor Reef, thus narrowing the passage to 70 yards but leaving a depth of 4 fathoms.

Directions for Alexander Inlet.—Do not shoal the water to less than 7 fathoms until the south point of North Reef is in range with the north side of Meneilly Island bearing 102° (ESE. $\frac{1}{4}$ E.); the inlet will appear just closed to the northward and the old beacons, if still standing, will appear in range. Proceed in, keeping the lead going, which, if in the right track, should not give less than 13 feet of water on the narrow ridge joining the Brothers and Sisters. When past the former (which, if not breaking, generally show themselves by their yellow color contrasting with the dark color of the deep water on the channel edge of them) keep southward so as to avoid Sylvia Rock, and steer in mid-channel, dropping anchor in 3 to $3\frac{1}{2}$ fathoms 150 yards eastward of Harbor Reef. Here a vessel 150 feet long at single anchor with 20 fathoms of chain could ride out the heaviest gale, swinging clear all around.

Charles Inlet runs in 440 yards northward of Alexander Inlet, taking an east-northeasterly direction for 3.6 miles, when it joins Naishcotyang River by a boat channel. Though there is not room to swing at anchor at the mouth of this inlet, yet for rafting purposes a vessel can, by means of buoys, carry 3 fathoms in and tie up to the rocks. To proceed into Charles Inlet, keep on the Alexander Inlet leading mark until the bottom of Charles Inlet comes in range with Jarrad Island bearing about 57° (NE. by E. $\frac{1}{4}$ E.), when proceed for it, passing close to the latter and northward of the sunken rocks 300 yards inside or northeast of Jarrad Island.

Hangdog Point is a broken-up foul point on the south side of Alexander Inlet. In approaching Alexander Inlet from the southeast the point should receive a good berth, as there is only 11 feet

water (1886) on Hangdog Bank 1 mile west-northwest of the point. In thick weather a vessel in this vicinity should keep in more than 7 fathoms.

Point au Baril.—From Hangdog Point the broken-up coast continues in a generally straight southeast by south direction 6 miles to Point au Baril, and for this distance there is nothing remarkable about the coast line, which presents the same low, sparsely wooded, shallow shore; as little as 12 feet in spots being found 1 mile off, and to avoid which a vessel should not shoal to less than 7 fathoms. The most conspicuous object for identification of Point au Baril in the afternoon is the white side of the front lighthouse. The approach to the back waters of Shawanaga Bay or Franklin Inlet, together with its summer visitors, renders Point au Baril more important than does its fishery, for which, of course, it is well situated. It is of consequence, too, as being an excellent harbor and the only one that a stranger could take between Byng Inlet and the anchorage under Mink Islands.

Wharf—Hotel.—At the northeast end of the small wharf on the north side of the harbor there was, in 1914, a depth of 13 feet. There was also a large hotel on Baker Rocks for the accommodation of summer visitors, and several summer cottages round the shores of the harbor.

Although a vessel has to run the gauntlet between many shoals, and moreover the passage 1.1 miles from the outer range lighthouse is only 150 yards broad, yet the range lights by being so far apart are so sensitive that the mariner can confidently rely upon the two lights in one taking him in with not less than 15 feet, although at very low stages of the water there may be 4 feet less. In July, 1914, the lighthouse tender steamer *Simcoe*, drawing 18½ feet, proceeded in and out on the range without touching.

A small steamer from French River on Byng Inlet bound for Parry Sound by taking the inside passage via Point au Baril would, with the exception of the gap between Red Rock Lighthouse and Snake Island, have smooth water from Point au Baril to Parry Sound, which notwithstanding adding 4 miles to the distance would be a great advantage in westerly gales.

Between Point au Baril and Twin Island at the southern entrance of Shawanaga Bay a vessel can carry 12 feet with the water surface 579 feet above mean tide at New York. In the year of the survey (1886) the water was 4 feet above this datum.

Outside coast and dangers between Point au Baril and McCoy Islands.—Lookout Island, which gives the shelter to the harbor of Point au Baril, is 590 yards broad, and, including the islands on the north side, is nearly 1 mile long. The summit near its northeastern extremity is 42 feet high. There is a passage into

the harbor on either side of Lookout Island, but the eastern channel is fit only for boats on account of the many shallow spots in the approach to it.

Range Lights—Front Light.—A fixed white light, 38 feet above water, visible 10 miles, is shown from a white, square, wooden structure on the southern end of Point au Baril.

Bear Light.—A fixed red light, 93 feet above water, visible 10 miles, is shown from a skeleton tower, 1,600 yards $104^{\circ} 30'$ (ESE.) from the front light.

These in range bearing $104^{\circ} 30'$ (ESE.) lead in.

Minnie Rock, 2 feet high, is about 1,175 yards northwestward of the front range lighthouse and 120 yards north of the ship's track. It lies the same distance off the point dividing Nares Inlet from the bay northwestward of the front lighthouse.

Armstrong Rocks, 9 feet high, are situated opposite Minnie Rock, the middle and largest one having in 1886 an isolated balsam tree near the southern extremity. The distance from these rocks to Minnie Rock is 300 yards, but the navigable channel is further contracted by a rock with 7 feet water on it, lying 100 yards north of the largest Armstrong Rock. This, together with the little flat off Minnie Rock, renders it necessary that the line of the range lights should be rigidly adhered to. Fishing boats pass between Armstrong Rocks and Lookout Island.

O'Brien Islands are the outer two of the string stretching southwestward from Lookout Island, the larger and inner one of the two being 8 feet high; they are sometimes called the inside Black Bills.

Doran Rock, 6 feet high, lies 1,175 yards south-southeast from the outer O'Brien Island.

Challenger Rock, with only 2 feet water over it, lies $1\frac{1}{4}$ miles northwest from the same, and 300 yards north of this shallow spot is a patch with 9 feet on it.

Corner Rock, with 16 feet over it, is the most outlying shoal in this locality, and from it the front range lighthouse is over the middle of the largest of the Armstrong Rocks. The shoal is 880 yards southward of the range and $2\frac{1}{2}$ miles from the front range lighthouse.

Beacons.—Two white beacons are erected upon the shore 12.3 miles northwestward of Point au Baril front range lighthouse, which kept in range bearing 40° (NE. $\frac{1}{4}$ E.), will lead a vessel northwestward of Corner Rock and the Black Bills.

Black Bill Islands.—These islets, or, more strictly speaking, bare rocks, are situated $3\frac{3}{4}$ miles southwest from the summit of Lookout Island, Point au Baril. The highest rock is 9 feet above the water and offers a good foundation for a lighthouse at some future day. These rocks occupy a space of about $\frac{1}{2}$ mile and are surrounded by shallow water, the space between them and O'Brien Islands being

totally unfit for the passage of anything larger than a fishing boat. The most important sunken rocks near the Black Bills are—

Lindsay Rock, just covered and generally breaking, is situated 1.3 miles northwest by north from the highest Black Bill.

McKenney Reef extends 880 yards northward of Lindsay Rock.

Meaford Shoal, with 6 feet water on it, lies 880 yards westward from Lindsay Rock.

Vail Rock, with 10 feet water over it, lies 880 yards 201° (SSW. $\frac{1}{2}$ W.) south-southwest from Lindsay Rock.

A bank with 5 to 9 feet on it stretches 880 yards in a west-southwesterly direction from the Black Bills.

Eagle Reef lies 1,320 yards west-northwestward of the highest Black Bill.

Oliver Rock lies a little over 880 yards westward of the highest Black Bill.

Southeast Rock is the southeastern of the Black Bills. It stands alone, is 5 feet high, and a shallow bank extends 880 yards in a southerly direction from it.

Caution.—A vessel should not shoal to less than 10 fathoms in the vicinity of the Black Bills. As before remarked, there is no passage for a vessel northeast of these rocks.

Kennedy Bank is one of the most dangerous shoals on this shore, there being only 9 feet in two places, and in low stages there may be 4 feet less. The northwestern shoal spot is $4\frac{1}{2}$ miles 265° (W. $\frac{1}{4}$ N.) from the highest Black Bill Island, the second patch with the same depth lying 440 yards southeast of it. These spots are the shoalest parts of a large bank, which, under the depth of 6 fathoms, is $1\frac{1}{2}$ miles long north and south, with a maximum breadth of 1,320 yards. The soundings off the east side of the bank give no warning of its vicinity, there being 14 fathoms at 100 yards, and much the same depth until within $1\frac{1}{2}$ miles of the Black Bills, but, from the southwest and northwest good indication is given with the lead, and if a vessel keeps in not less than 10 fathoms she can not touch either patch.

Light buoy.—A red cylindrical buoy, showing an occulting red light, is moored in 54 feet off the western side of Kennedy Bank.

Buoy.—A spar buoy, painted black and white horizontal bands, is moored northeast of the shoalest part of the bank.

McIntosh Bank, with least water 21 feet, is separated from Kennedy Bank by a channel 880 yards wide, and 14 fathoms deep. This rocky bank under the depth of 6 fathoms is 1 mile long by 590 yards in breadth.

In thick weather if a vessel from the southeast shoals her water to the depth on this bank, deepens it, and shortly shoals again, she will likely be in the proximity of Kennedy Bank.

Heart Bank, with least water $4\frac{1}{2}$ fathoms, and taking its name from the shape of the 10 fathoms curve, is situated $3\frac{1}{2}$ miles north-northwest of Kennedy Bank. Within the depth of 10 fathoms it is 1,175 yards in diameter. A vessel on a 150° (SSE.) course in thick weather getting a sounding of $4\frac{1}{2}$ to 7 fathoms, then deepening the water from 12 to 16 fathoms for 2 miles, and again shoaling to less than 10 fathoms, will probably be on part of Kennedy Bank and in danger of running on one of the 9 foot spots.

The western shore of the large group of islands which shelters the inside passage from Point au Baril to Twin Island is very ragged and shallow, and no vessel should pass northeastward of the line joining Black Bill and the McCoy Islands.

McCoy Islands are the two northwestern wooded islands of the large group extending to Mink Islands commonly called the Minks and, by Bayfield, the Indian Islands. From the western and smaller McCoy Island 16 feet high, dry rocks and bare islets extend between northwest and west by south for 1.6 miles.

Southwest Island is an almost bare islet situated over 1,320 yards westward from the smaller McCoy Island. Its flat summit is 14 feet high, and the depth of 10 fathoms approaches to within 880 yards of its western side.

Colin Rock, awash, lies northnorthwest rather over 1,320 yards from Southwest Island, and another rock of similar character called Duncan Rock lies 590 yards northnortheast from Colin Rock, both being situated 440 yards northwestward of the outer islets.

Kenneth Patches, with 10 to 15 feet over them, extends 880 yards southwestward of Colin Rock.

Caution.—There being 12 fathoms close to these shoals, the lead in thick weather will give little warning in approaching them.

Point au Baril to Twin Island by Shawanaga Passage.—The distance from the front range light to Twin Island is $11\frac{1}{2}$ miles. Speaking generally, this passage may be divided into three divisions or reaches, that from Point au Baril to Abbot Island taking the name of the former; Abbot Island to Turning Island may be termed Middle Reach, while the remaining portion is really a portion of Shawanaga Bay.

Beacons.—A series of red beacons and white beacons have been erected on the turning points of the islands (described later) which border the passage, and by means of these, the directions here given, and the chart, a vessel drawing 12 feet water should have no difficulty in getting through, even at the low-water stage of 1895 (579 feet above mean tide at New York). In coloring these beacons the channel has been considered as leading to Parry Sound, and the beacons painted red are those which a vessel must leave on her star-board hand in proceeding from Point au Baril.

In strict conformity with the Canadian system of buoyage those beacons on the port hand should have been painted black, but as white is more conspicuous against the dark trees and rocks, it has here been adopted. With the exception of the rock, with less than 6 feet water on it, lying 75 yards northeast of the southeastern Double Island and marked with a red spar buoy, there are no dangers in the Point au Baril reach until in the vicinity of Lauder Island, between which and Point au Baril rear range lighthouse there are one red and three white beacons, in addition to the two white beacons forming Sing Narrows Range.

A ledge with 8 feet water on it at low stages extends one-third of the distance across the channel (known as Sing Narrows) from the eastern Lauder Island. To pass northeast of this rock keep nearer the northeast shore and Sing Narrows beacons in range ahead bearing about 113° (SE. by E. $\frac{1}{4}$ E.). At 100 yards northwest of Lauder Island is a shallow rock connected to the long and shelving point nearly opposite it (marked by a white beacon) by a ridge narrowing the channel and limiting the depth to 12 feet.

Passage Island, 10 feet high, small, and in two parts, lies near the junction of the Point au Baril and Middle Reaches. Vessels have hitherto passed northeastward of this little island, and between it and Sedgewick Point, taking care to pass exactly through the middle of the channel to avoid a shoal rock on either side. The channel is very narrow but has a depth of 17 feet, and the sunken rock on either side can be seen from the deck.

Beacon.—A white pyramidal beacon with triangular topmark is erected on Sedgewick Point, which is foul.

A wider and deeper channel than that now used exists eastward of Abbot Island (situated 440 yards farther southwestward, care being taken to avoid the rocky spit extending 100 yards from the southwest point of the island situated between Abbot and Passage Islands).

Beacons.—A red beacon with a white square as topmark stands upon the east point of Abbot Island, and a similar one known as Haggart Narrows Beacon is erected on the southwest side of the passage, on a rock a little northwest of Abbot Island.

Abbot Island to Turning Island.—This portion of the inside channel constitutes Middle Reach, and a description of its north side will first be given.

Duke Rock, 7 feet high, with a boat passage between it and the north shore, is small and round and is situated 440 yards eastward of Passage Island.

Buoy.—A red spar buoy is moored on the south side of the passage in the vicinity of Duke Rock.

Pym Rock, about 40 feet square and 3 feet high, lies 200 yards off the north shore and a little more than 880 yards east-northeast from Duke Rock; it has fairly good water all around it.

Beacon.—A white pyramidal beacon with triangular topmark is erected on Pym Rock.

Pollard Island, rather over 880 yards in length, and situated that distance eastward of Pym Rock, has a small wooded islet 10 feet high and a cluster of dry rocks about it lying close to its southwestern extremity, and close to which the water is deep.

Mackey Island lies at the junction of the upper portion of Shawanaga Bay (or Franklin Inlet) with Middle Reach. Its southern extremity is just separated from an islet 11 feet high, 50 yards west of which is a shallow sunken rock.

Turning Island, as its name indicates, marks the turning point from Middle Reach into the main body of Shawanaga Bay. The island is small, has a few bushes on it, and, being 17 feet high, presents a good object for which to steer. A shallow rock lies 50 yards off its southwestern extremity, and two dry rocks 3 feet high lie 300 yards northeast of Turning Island; also a rock with 9 feet over it lies 590 yards northeast from the same.

Beacon.—A white pyramidal beacon with triangular topmark is erected on the southwest point of Turning Island.

Nadeau Island, 48 feet high, has lying close to its northeast side a wooded islet and cluster of islets and dry rocks, off which a bank with 10 to 15 feet water over it makes out to within 150 yards of Turning Island. The channel is between this bank and Turning Island, with a depth of 4 fathoms.

Returning westward by the south shore of Middle Reach, the next island worthy of note is High Pine Island situated 880 yards west-northwest from Turning Island; two bare islets lie 200 yards southeast of High Pine Island.

Stairs Island, partially burnt and about 20 feet high, lies 590 yards northwestward of High Pine Island, and in the bight between the two a vessel will find good anchorage in 6 fathoms over mud.

Bigg Rock, with 9 feet over it, lies northwestward 590 yards from the northeastern extremity of Stairs Island.

Carey Rocks, 5 feet high, are situated 1,320 yards northwestward of Stairs Island, and 100 yards west of an islet 7 feet high with bushes on it. Shoal water makes off 200 yards northeast and northwest from Carey Rocks.

Sultan Rock, 2 feet high, is a small bare rock 270 yards southward of the coast of the north shore near Duke Rock.

A rock with 11 feet of water on it (in low stages there may be 4 feet less), lies 100 yards northward of Sultan Rock, narrowing the

ship channel to 150 yards, in which, however, there is a depth of 6 fathoms.

Ripple Rock, with 6 feet water over it, is situated nearly 300 yards northeast from Sultan Rock, and is a very awkward obstruction, necessitating keeping close to Duke Rock. Sedgewick Point, Passage, and Abbot Islands in range lead north of it. There is no passage southward of Ripple Rock on account of another with 3 feet over it.

Directions—Abbot Island to Turning Island.—After emerging from the beacons channel between Point au Baril and Haggart Point, haul sharply southward, passing close eastward of Abbot Island Beacon, and then steer eastward to pass between Ripple Rock Red Buoy and Duke Rock, keeping the southern extremities of Abbot and Passage Islands together with Sedgewick Point in range, bearing about 256° (W. $\frac{1}{2}$ S). When abreast of Pym Rock Beacon haul to starboard so as to bring the north fall of the bluff at the Indian Cove open northward of Turning Island the breadth of the latter, bearing about 121° (S. E. $\frac{1}{2}$ E.) until 440 yards from Turning Island, when alter course so as to pass about 100 yards west of it and proceed as hereafter directed.

Turning Island to Twin Island—Principal features and dangers on the eastern side of the passage:

Mosley Island, 8 feet high and bare, marks the southern point of a deep indentation, in the southeast corner of which is a small wharf and store belonging to the Shawanaga Indian Reserve situated further inland.

O'Connor Rocks, 1 mile northward of Mosley Island, mark the northern extremity of this bay. A line drawn from O'Connor Rocks to Mackey Island marks the northern limit of the survey of Shawanaga Bay, although it is reported that vessels can proceed much further north.

Bald Rock, 13 feet high, is $1\frac{1}{2}$ miles southward of Mosley Island.

Young Island, 7 feet high, is situated 880 yards north-northwest from Bald Rock; shoal water connects it to the rocks on the east shore, but between it and Grave Island the water is deep.

Lloyd Island, in two parts, quite bare and 9 feet high, lies 300 yards northeastward of Grave Island, the ship channel passing between them.

Beacon.—A white pyramidal beacon with triangle as topmark is placed on the summit of Lloyd Island.

Green Island, the next conspicuous feature on the east shore, is partly wooded 16 feet high, and stands prominently out from the south. It is $2\frac{1}{2}$ miles northward of Twin Island, and is separated from Green Point by a boat channel.

Green Island Bank extends in a general north by west direction nearly 880 yards, in which position there is 7 feet. To clear the

whole of this bank keep Turning Island just its breadth open east of Grave Island, bearing 4° (N. by E. $\frac{1}{2}$ E). The coast between Bald Rock and Green Island is indented by several sandy coves. The shore from Green Point trends in a general southerly direction with a series of bays, to the north entrance of Shebeshekong Bay. It is wooded, 30 to 50 feet high, with bare patches near the water.

Western side.—**Jack Reef** is a dangerous obstruction with 5 feet water over it, lying a little over 590 yards northeast by east from the northwestern extremity of Twin Island.

Callady Rock, 2 feet high, is situated 1,175 yards north-northwest from the northwestern extremity of Twin Island.

Pease Rock, with 10 feet water on it, lies nearly mid-distance between Callady Rock and the northwestern end of Twin Island, to which it is joined by shallow water.

Anchorage in 4 fathoms over mud may be had 300 to 400 yards southward of Callady Rock, and excepting a little sea from the southward, perfect shelter had with all winds. This will be found a very useful anchorage when overtaken by darkness in the navigation of these inner waters.

McCormick Island, 12 feet high, lies 440 yards northward of Callady Rock, to which it is connected by shallow water. In leaving the anchorage for the north, this island should receive a berth of 300 yards.

Anchor Island, about 200 feet high, is so named from being situated 440 yards southward of the anchorage in over 4 fathoms mud near the eastern mouth of Frederic Inlet. Being about 30 feet high, bare and level, it is easily recognized. It is 1.3 miles northward from McCormick Island. A boat, and possibly with the assistance of a few buoys, a small tug, may pass through Frederic Inlet to the outside shore.

Josephine Rocks are a cluster 5 feet high lying 1,175 yards northward of Anchor Island, and southwest from these, rocks with less than 6 feet water over them extend 300 yards, which should be carefully avoided.

Grave Island, called by some Bald Island, is a prominent feature standing near the ship's track and having an elevation of 22 feet. It is connected to the west shore of Shawanaga Bay by a chain of dry rocks.

Beacon.—A red pyramidal beacon with white square topmark is erected upon the southeast point of the island from which a reef extends 50 yards; the island is otherwise steep-to.

Jane Rock, with 4 feet of water over it, lies with Turning Island just shut in westward of the southeast point of Grave Island, distant from the latter 590 yards. Another spot with 6 feet on it lies 120 yards nearer Grave island.

MacGregor Rock, with 11 feet on it (in low stages there may be 4 feet less), is a small lump lying 300 yards southward from the southeastern extremity of Grave Island. The eastern extremity of Mackey Island touching the west side of Turning Island, bearing about 1° (N. $\frac{1}{4}$ E.), leads just clear of this rock.

Note.—For vessels drawing over 10 feet there should be a buoy placed on this rock.

Nadeau Island has been already alluded to in connection with Middle Reach, and marks the junction of it with Shawanaga Bay. Midway between Nadeau and Grave Islands is a small partially wooded Island about 20 feet high, called Chowne Island off which the water is deep.

Directions—Turning Island to Twin Island.—Having passed, as before recommended, about 100 yards west of Turning Island, Twin Island will be seen between Grave and Lloyd Islands. Steer for it so, with the west end of Turning Island in range with east end of Mackey Island, bearing about 1° (N. $\frac{1}{4}$ E.). This range leads 100 yards east of Grave Island, and when past MacGregor Rock keep Turning Island its breadth open east of Grave Island bearing 4° (N. by E. $\frac{1}{4}$ E.).

This mark should be kept on astern, the vessel heading for about the northwestern extremity of Twin Island. When 440 yards from the latter a vessel will be midway between Jack Reef with 5 feet and Pease Rock with 10 feet over it, and the northwest Oak Island of Shebeshekong Bay a little open eastward of Twin Island, when the course may be altered to pass about 150 yards eastward of Twin Island.

Beacon.—A red beacon surmounted by a white cross is erected on the southeastern extremity of Twin Island.

Twin Island to Point au Baril.—Pass 150 yards eastward of Twin Island Beacon, and coast along its northeast side, keeping the northwest Oak Island in sight until Turning Island appears its own breadth eastward of Grave Island. Keep the islands in this position bearing 4° (N. by E. $\frac{1}{4}$ E.), with the northwest point of Twin Island astern. When nearing MacGregor Rock, and not wishing to pass over it, keep the northeastern extremity of Mackey Island touching the west side of Turning Island, bearing about 1° (N. $\frac{1}{4}$ E.) until up to the latter.

Pass 100 yards west of it, steering northward until the north fall of the wooded bluff in Indian Cove comes northward of Turning Island the breadth of the latter. Keep these objects in this position astern, with Pym Rock Beacon ahead, bearing about 304° (NW. $\frac{1}{4}$ W.). When 200 yards from the latter the south points of Abbot and Passage Islands will be seen in range with Sedgewick Point. These should be kept so in order to lead north of Ripple Rock, usually

marked by a red spar buoy. Pass between Abbot Island and that next eastward of it and follow the line of the red beacons and white beacons, taking care to pass northeastward of the sunken rock in the bight northeastward of the eastern Lauder Island by keeping the Sing. Narrows Range Beacons in range astern, bearing about 112° (SE. by E. $\frac{1}{4}$ E.).

When Sidney Island is reached Point au Baril will be seen and may be steered for, passing close to the north point of Double Island to avoid the rock with 4 feet water over it, and usually marked by a red spar buoy, lying midway between Double Island and the main shore. Pass close to the front lighthouse and bring the lights in range astern to lead out into the bay.

Anchorage.—Excellent anchorage will be found eastward of Double Island, by dropping anchor in 6 fathoms with the front lighthouse over Double Island and farther distant from Double Island than Johnny Rock.

Boucher Island, long, narrow, wooded, and 18 feet high, is situated nearly midway between Green Island and the fishery establishment. A steep bare rock 27 feet high, lies 440 yards southwestward from the southeast end of Boucher Island.

Mink Island Fishery.—Near the southeastern extremity of the whole string, is situated the highest and largest island of the group 30 feet high, on which is erected a small wharf, ice house (still standing, 1914), and huts in connection with the fishing business undertaken during the summer. The island and its attendant rocks afford good shelter in all winds for fishing boats, and the small wharf on the east side of the island can generally be approached for the purpose of embarking the fish.

Anchorage.—The surveying steamer *Bayfield*, during the progress of the survey in 1890, 1891, frequently anchored about 250 yards northwestward of the wharf in 5 fathoms good holding ground, with just room to swing with 25 fathoms of chain, sheltered in northerly winds by the two groups of rocks, dry and sunken, known as Harbor Rocks and Dixon Bank.

A strange vessel of heavy draft, if seeking shelter under The Minks, should anchor in 11 fathoms muddy bottom, $1\frac{1}{4}$ miles from the ice house bearing about 248° (WSW. $\frac{3}{4}$ W.). If the weather be clear, from this position the south side of Bateau Island should be touching the north side of Little Snake Island—the leading mark for this part of the inside channel.

Old Tower Island, 16 feet high, is the southern one of the whole chain and upon it stood the building which, before the erection of the lighthouse upon Red Rock, contained a light.

Red Rock.—From Old Tower Island shoal water extends to a rock 14 feet high, called by the not uncommon name on this shore, Red Rock.

Red Rock Light, occulting white, 60 feet above water, visible 3 miles, is shown from a red, polygonal lantern on a concrete building at the entrance to main channel to Parry Sound.

Note.—The usual breadth and coloring of this lighthouse renders it by far the most conspicuous object in this locality where prominent features are so rare.

Fog signal.—The fog signal is made on a diaphone.

Lawson Rock, with 4 feet of water on it, lies nearly 1,175 yards westward from Red Rock Lighthouse; another shoal head with the same depth on it, is situated 200 yards northeastward of Lawson Rock. Both these spots break in a moderate sea.

Clearing marks.—The whole of Green Island open west of the nearer Mink Islands, bearing 338° (N. by W. $\frac{3}{4}$ W.), leads southwest, and the south side of Franklin Island in range with Red Rock Lighthouse bearing 76° (E. $\frac{1}{2}$ N.), leads south.

McGowan Rock, with 10 feet water on it, is situated 440 yards south-southeast from Red Rock Lighthouse.

A rock, with 21 feet least water on it, lies about 880 yards south-east by south from Red Rock Lighthouse.

Buoy.—A black spar buoy is moored on the south side of this rock.

Richmond Rock, with 12 feet of water on it (in low stages there may be 2 feet less) is a dangerous obstruction for a heavy draft vessel, situated a little over $1\frac{1}{2}$ miles 261° (W. $\frac{1}{2}$ S.) from Red Rock Lighthouse. The mark for leading south of Lawson Rock leads also southward of this danger.

Buoy.—A black spar buoy is moored on the south side of this danger.

North Limestone Island, 12 feet high, is flat, with a few scattered bushes on it, and had in 1891 an isolated umbrella-shaped tree near its northeast extremity. This island is rather over 880 yards long, with an average breadth of 200 yards, and lies 2.6 miles from the nearest McCoy Island. A bank under 10 fathoms joins North Limestone Island to the southern portion of McCoy Islands.

Midland Bank extends from the northeastern extremity of North Limestone Island 1,175 yards, where there is a depth of 12 feet over rock.

City Rock, with 4 feet water over it, is a small reef lying 880 yards eastward from the northeastern extremity of the same island.

Chesapeake Rock, with 4 feet water on it, lies a little over $\frac{1}{2}$ mile southwestward of the southern extremity of North Limestone Island.

West Reef extends 590 yards westward from the western point of North Limestone Island, with a depth on it of 9 feet; shallow water extends 300 yards from the northwest side, and 200 yards from the southwest side of North Limestone Island.

Stalker Bank, with 17 feet water on it, is situated nearly $3\frac{1}{4}$ miles 301° (NW. $\frac{1}{2}$ W.) from the southwestern extremity of North Limestone Island, and should be avoided by a heavy draft vessel in a heavy sea. The light color of the limestone bottom, seen through the generally clear water in this locality, gives it the effect of being much shoaler than it is.

Long Bank is worthy of mention as being useful in thick weather as a warning of the vicinity of The Limestones. This rocky bank under the depth of 10 fathoms is nearly 4 miles long in a north by west direction, with an average breadth of $1\frac{1}{4}$ miles, and is separated from the shoal water about The Limestones by a lane of water 14 to 16 fathoms in depth over a sandy and clay bottom.

The shoalest water on Long Bank is 6 fathoms over rock near the northern extremity. A depth of 13 fathoms exists between Long Bank and the 10-fathom curve round Stalker Bank. Another bank

with 8 fathoms water on it lies 1,175 yards westward of the northern part of Long Bank.

In thick weather a vessel from the west getting a cast of 10 fathoms or less will be in the vicinity of The Limestones, and should not proceed further until the latter are discernible.

South Limestone.—This island is of the same height as the northern one, but appears higher on account of the thicker character of the bush (1890). It is $1\frac{1}{2}$ miles from North Limestone Island, and there is a passage between them 1 mile in width, with a depth of 5 to 7 fathoms mixed bottom.

Wallis Rocks, of granite formation, consist of a cluster of bare rocks 880 yards in greatest length, the middle one of which has a sharpish mound on it 10 feet high. These rocks are separated from South Limestone Island by a channel the navigable breadth of which, between the shallow water on either side, is 440 yards in the narrowest place, the depth being 8 fathoms.

The deep water comes close in to the eastern sides of Wallis Rocks and South Limestone Island, but the other sides of the latter are foul for a considerable distance, as little as 12 feet being found 880 yards southward.

Shannon Rock, 2 feet high and small, lies nearly 590 yards north-east by north from the northeast point of South Limestone Island; it has deep water round it, and a depth of 4 fathoms between it and the bank extending 440 yards from the northern extremity of South Limestone Island.

Provo Shoal, with 15 feet over it, lies 1 mile east-northeast from the northeast point of South Limestone Island; it is a small patch with deeper water close around it.

South Limestone Bank is a large area of depths under 10 fathoms, extending in a general southwesterly direction $2\frac{1}{2}$ miles from the island of that name. The shoalest spot with 18 feet over rock lies nearly $2\frac{1}{4}$ miles southwest by west from the highest part of South Limestone Island. The 10-fathom curve of this bank is separated from that of Long Bank by a lane 1,175 yards broad, and depth of 16 fathoms over sand and clay.

Lawrence Bank, with $4\frac{1}{2}$ fathoms least water, lies 1 mile southward from South Limestone Island.

Hankinson Bank, with 5 fathoms least water, is another rocky elevation of the bottom situated 880 yards southeastward from South Limestone Bank, its length in a northeast direction being $1\frac{1}{2}$ miles with an average breadth of over 590 yards.

Seguin Bank, under the depth of 10 fathoms, is 2 miles long in a northeasterly direction, with a maximum breadth near its northeast end of 1,320 yards. The shoalest part has 17 feet of water over white limestone bottom, and its middle bears 171° (S. $\frac{1}{2}$ E.) 4 miles

from the nearest part of South Limestone Island. The same part of the bank also bears 245° (WSW. $\frac{1}{2}$ W.) and is $5\frac{1}{4}$ miles from Red Rock Lighthouse.

Light buoy.—A black cylindrical buoy, showing an occulting white light, is moored in about 16 feet on the southern end of the bank.

Caution.—The line of the Snug Harbor range lights bearing 71° (E. by N.) leads over the southern part of the shallow portion of Seguin bank; a vessel of heavy draft should therefore pass south of the light buoy.

In clear weather, and in daylight, an excellent cross mark for this bank is the corresponding extremities of North and South Limestone Islands in range. Like Stalker Bank, of the same depth and character of bottom, the water on Seguin Bank appears to be much shoaler than is actually the case. The master of a vessel passing close to both these shoals would unhesitatingly affirm that there was not more than 9 feet water on them.

The portion of the inside channel from Twin Island to Black Rock will now be treated. Speaking generally, this piece of water is contained between Mink Islands and Franklin Island, and if the track is rigidly adhered to, not less than 4 fathoms can be had. As there are numerous shoals on both sides of the track, only those nearest the passage will be particularized, beginning near Twin Island of Shawanaga Bay, first treating of those westward of the ship's track.

Pease Rock is really the termination of the shallow water extending 590 yards in a north-northwest direction from the northwestern extremity of Twin Island.

Twin Island lies in the south entrance to Shawanaga Bay; as its name indicates, it is almost divided into two parts, each portion attaining a height of 25 feet. The ship channel is on the east side of the island, a reminder of which is a red beacon erected on the southeast point. A spit makes off from the southeastern extremity of the island 50 yards, but the northeast side of Twin Island is clean.

Newburn Rock, 12 feet high, lies 880 yards northeastward from the southeast point of Twin Island.

Keegan Rock, 3 feet high, lies a little over 590 yards eastward from the same. These two rocks are connected by a shallow bank and should be passed westward of; the channel being between them and Twin Island.

Catherine Rock, with 6 feet water on it, is situated nearly 1,320 yards southwest from the southeastern extremity of Twin Island.

Edwards Bank, with 6 feet water on it, is situated nearly mid-distant between Twin Island and the fishery establishment on Mink Islands. It is nearly 1,320 yards westward of the line joining the

southeastern extremity of Twin Island and Red Rock Lighthouse—the vessel's track. Two patches with 15 and 17 feet on them lie eastward of Edwards Bank and consequently nearer the track, but are of little importance, as no vessel drawing the latter depth of water should attempt the inside channel to Point au Baril.

Hudgen Ro, with 14 feet water on it, lies 1 mile north-northeast from the ice house at the Minks and 440 yards southwestward of the vessel's track.

From the fishery establishment a string of rocks dry and sunken extends nearly 1 mile southeastward, the outer dry rock just above the water being known as Freeman Rock, from which a shoal extends in a southerly direction 440 yards. The deep water approaches close to the northeast side of this chain, thus facilitating the approach to the wharf at the fishery.

Farr Rock, with 10 feet water on it, is situated nearly 1,320 yards east-northeast from Red Rock Lighthouse; there is a depth of 5 fathoms between Farr and Freeman Rocks. A spot with 13 feet on it lies south-southeast 250 yards from Farr Rock, and on this patch a buoy should be placed as a safe turning point for vessels wishing to communicate with the fishery or to anchor under the Minks.

Cook Reef, with 15 feet water on it, lies nearly 880 yards east by south from the fishery ice house.

The foregoing are the principal dangers westward and southwestward of the ship's track in this portion of the inside channel, excepting Snake Bank, which will be particularized when treating of Main Channel from seaward. The obstructions on the port hand, as a vessel proceeds from Twin Island to Black Rock, will now be treated.

Milo Rock, with 10 feet water on it, lies south by east 1,320 yards from the southeast point of Twin Island. As this danger lies only 300 yards eastward of the course, care should be taken to keep in an exact line between the southeast point of Twin Island and Red Rock Lighthouse. After passing southward of Milo Rock, the western entrance to Shebeshekong Bay and the northwest Oak Island (forming the south entrance point to the same) will be seen, and no other dangers have been discovered very near the vessel's track until east of the fishery ice house.

Young Rock, with 4 feet water on it, lies $1\frac{1}{4}$ miles eastward from the ice house.

Bailey Rock, with 6 feet water over it, is the most dangerous obstruction to be met with eastward of the track between Twin Island and Black Rock on account of its shallowness and being only 440 yards from the leading mark. It bears 70° (ENE. $\frac{1}{4}$ E.), a little more than $1\frac{1}{4}$ miles from Red Rock Lighthouse, and 293° (NW. by W. $\frac{1}{4}$ W.) $1\frac{1}{4}$ miles from Black Rock.

Clearing mark.—The southwest side of Bateau Island in range with the northeast point of Little Snake Island, bearing 141° (SSE. $\frac{1}{2}$ E.), leads 500 yards southwestward of this danger.

Vankoughnet Ground, with depth on it of 13 feet, is situated 880 yards southeastward of Bailey Rock, and is a more formidable danger to heavy draft ships using Main Channel.

Buoy.—A black spar buoy marks this danger.

Black Rock—Beacon.—Black Rock is a dark-colored rock 12 feet above the water, 150 yards long by about 50 yards broad, and has erected upon it a rectangular slatwork beacon painted white with a black rectangular topmast, the latter color indicating that it must be left on the port hand when entering Parry Sound. With the exception of a sunken rocky spur extending 50 yards from the south end, it has good water close to it on the channel side. A glance at the chart will show that no vessel should attempt to pass north-eastward of Black Rock.

This rock lies 1 mile southward of Franklin Island, and between them there is a passage for vessels to Snug Harbor and Shebeshekong Bay. Black Rock bears 90° (E. $\frac{1}{2}$ S.) and is nearly $8\frac{1}{2}$ miles from Red Rock Lighthouse, the line joining the two passing 440 yards northward of Three Star Shoal.

Arthur Orr Rock, with 17 feet least water over it, is a small pinnacle lying 880 yards south by west from Black Rock Beacon and only 150 yards northeast of the Jones Island Range. Masters of vessels should therefore be careful to see they are exactly on the range when in this vicinity.

Buoy.—A black spar buoy marks this danger.

A rock with 15 feet water over it lies 440 yards south-southwest from Black Rock.

Shebeshekong Bay is the name usually applied now to the whole of the passage separating Franklin Island from the main shore, though the name was originally given to the inlet running in $1\frac{1}{4}$ miles eastward of Corbman Point, the northern extremity of Franklin Island. It was reported that as much as 18 feet water could be carried through this passage, but the survey has resulted in showing that at the Narrows, as the middle portion is called, the depth is not sufficient for vessels drawing more than 6 feet water.

During the progress of the survey in 1890, 1891, when the water was $1\frac{1}{2}$ to 2 feet higher than in 1895, the surveying steamer "Bayfield," drawing 10 feet, managed to scrape through as an experiment, but the lane of deep water was found to be of not much greater breadth than that of the vessel.

With local knowledge, or by a series of range beacons, as were temporarily erected for the passage of the "Bayfield," light draft

steamers would find here a smooth water passage on their way from Parry Sound to Point au Baril, when they could not face the sea which rolls in between Snake Island and The Minks in a southwest gale.

In the bottom of Shebeshekong Bay a stream empties, near which are located a few farmers, notable among whom in 1890 was an old man called Miner, who was for some years in the Hudson Bay Co. service, and with Dr. Rae in his search for Sir John Franklin. The mouth of the stream is accessible to boats and probably to small vessels, but time did not permit the survey being extended to this unimportant locality.

Franklin Island—Oak Islands.—The two northwestern islands (26 feet high) of the Franklin Archipelago above mentioned, are known as Oak Islands by reason of a number of trees of that character growing upon the southern island. The northern island has really few or no oaks upon it, but is a remarkable feature on account of its dark looking pines and high bare northward point.

The western entrance to Shebeshekong Bay, or passage, is well pointed out by this island, close to which the water is deep.

Corbman Point is the northern extremity of Franklin Island. The land here is bare, 18 feet high, and upon it is erected a couple of huts belonging (1891) to the person after whom the point was named. From the northern Oak Island to Corbman Point a depth of 18 feet may be carried, the track passing close to the northern islands belonging to the Franklin Archipelago, but as no master of a vessel should attempt even this portion of Shebeshekong Passage without local knowledge, time will not be wasted in attempting to give directions.

Burritts Point is the southeastern narrow extremity of Franklin Island. It is 2.6 miles southward from Corbman Point, and 2½ miles from Black Rock. In the years of the survey, 1890, 1891, a depth of 14 feet was carried from the latter to Burritts Point by keeping the beacon on Burritts Point Beach in range with one on the little rock near Horsley Island bearing 28° (NE. ¼ N.).

Burritts Point to Pancake Island.—In connection with the passage through Shebeshekong Bay it may be stated that an inside channel exists from the latter to The Pancakes, through which in 1891, 11 feet water was carried by means of beacons and buoys. In the absence of them, however, it would be worse than useless to attempt to give directions.

Snug Harbor is a perfectly sheltered anchorage 2½ miles northward from Pancake Island, and flanks the portion of the inside passage first mentioned. It is of importance on account of the situation of the rear light of the range which takes its name from the harbor.

Range lights—Front Light.—A fixed white light, 39 feet above water, visible 11 miles, is shown from a white, square, wooden structure on the westernmost Walton Island.

Bear Light.—A fixed white light, 62 feet above water, visible 13 miles, is shown from a white, square, wooden structure on a dwelling 1,033 yards 71° (E. by N.) from the front light.

These in range bearing 71° (E. by N.) lead through a portion of the main channel.

Directions—Black Rock to Snug Harbor.—When on the Jones Island range (described later), and Black Rock Beacon bearing 54° (N.E. by E. $\frac{1}{2}$ E.), the temporary beacons on Burritts Point and

Horsley Island will be seen in range and bearing 28° (N.E. $\frac{1}{4}$ N.). These should be kept exactly in range as far as the front beacon on the little rock near Horsley Island, leading over 14 feet water (at low stages there may be 2 feet less), near Cracroft Rock; the front beacon rock should receive a berth of about 50 to 100 yards to avoid the 9-foot patch on the starboard hand.

The vessel's head should be gradually turned southeastward until the entrance to Snug Harbor opens, taking care to keep southward of a small rock with 4 feet water on it lying 200 yards west by south from the harbor light. When past the latter, the anchor may be dropped in $4\frac{1}{2}$ fathoms, muddy bottom; or, the lighthouse supplies can be taken from the town of Parry Sound by tug through the channel northward of The Pancakes.

Islands and dangers between Red Rock and Cameron Island.—**Main Channel** is the route between the latter, and on which bay adhering rigidly to the ranges should take a vessel through 20 feet water (at low stages there may be 2 feet less). The features and obstructions on the north and northeast sides of the track as far as Cameron Island, will first be treated, McGowan Rock near Red Rock Lighthouse having been previously described.

A small rock with 21 feet water on it, lies $1\frac{1}{3}$ miles eastward from Red Rock Lighthouse and 880 yards northwestward from Three Star Shoal. As it lies only 150 yards north of the Snug Harbor Range, it is a danger to heavy draft vessels using the channel.

Buoy.—A black spar buoy usually marks its position.

Vankoughnet Ground is a danger to be avoided. It consists of two patches with 14 feet on the southern and 13 feet on the northern spot. The nearest part of the shoal to the line of the Snug Harbor Range lights is distant 300 yards, and lies a little less than 880 yards northward from the northern part of Three Star Shoal, the line of the range lights leading almost the same distance from each.

Buoy.—A black spar buoy is moored in 17 feet water near the south end of this ground.

Twin Rock—Beacon.—Twin Rock, 9 feet high and bare, situated southeastward of Black Rock, is in two parts, the northern rock having erected on it a beacon of a somewhat similar character to that on Black Rock, the two beacons being $1\frac{1}{4}$ miles apart.

A rock with 11 feet water on it lies 250 yards west from the gap separating the two islets, and being only 100 yards northeastward of line of Jones Island Range, the latter should be exactly kept when passing Twin Rock.

Buoy.—A black spar buoy marks this danger.

A shoal bank extends 350 yards northeastward from Twin Rock, but as the passage on this side of the latter is not to be recommended for large vessels, the bank will not be particularized.

Pancake Island is situated 1 mile eastward of Twin Rock, and is nearly divided in a high stage of water into three parts. The island is 32 feet high and thinly wooded.

A rock awash lies 150 yards off the southern extremity of Pancake Island, and a rock with 10 feet water on it is situated 440 yards westward from the same point.

A spit makes off the north end of the island 200 yards, and shallow water extends the same distance from the eastern side of Pancake Island. There is no recommendable passage for a deep draft vessel between Twin Rock and Pancake Island.

Anchorage.—Good shelter can be had about 440 yards off the east side of Pancake Island in a depth of 7 fathoms mud bottom, the farther northward the better the holding ground.

Spruce Island, 28 feet high, is the southeastern one of the group generally called the Spruce Islands.

Two small rocks 4 feet high, lie 440 yards southwest from the southern extremity of Spruce Island proper.

Two small rocks, 4 feet high, lie 440 yards southwest from the southern extremity of Spruce Island proper.

Spruce Island Shoal.—Westward and southwestward of these rocks a bank extends 300 yards with 2 to 12 feet water on it, narrowing the channel between it and McClelland Rock Beacon to 440 yards.

Light beacon.—An occulting white light, 39 feet above water, visible 11 miles, is shown from an octagonal, concrete, beacon tower near the southern extremity of Spruce Island Shoal.

Buoy.—Shoal water extending a short distance south of the above light beacon is marked by a black spar buoy.

Caution.—A patch with depth of 21 feet is reported to lie midway between this buoy and the red conical buoy marking the 16-foot spot lying east-northeast of McClelland Rock.

A rock awash lies 300 yards southward of the south point of Spruce Island, and off it a spit extends 200 yards east.

Buoy.—A black spar buoy marks the east end of this danger.

Carling Rock, 5 feet high, quite bare, and about 100 yards in diameter, occupies an isolated position 880 yards northwest from Cameron Island, and over 1,320 yards east-southeastward from the south end of Spruce Island. A dangerous bank extends south-eastward and southwestward 440 yards from Carling Rock.

Buoy.—The southeastern edge of this bank is marked by a black spar buoy.

Light.—An occulting red light, 26 feet above water, visible 7 miles, is shown from a white, square, wooden tower on the northern portion of the highest part of Carling Rock.

A spit, upon the northern end of which there is 16 feet water, extends 120 yards northeastward from the northern end of Carling Rock.

Buoy.—It is marked by a red spar buoy.

A rock with $13\frac{1}{2}$ feet water over it is situated 590 yards southwest from Carling Rock. With the exception of a fringe of shoal water 70 to 100 yards in extent, the northwestern side of Carling Rock is steep-to, and a good broad passage exists on this side of it and between it and Spruce Island by keeping Scott Island in Kilcourse Bay in the gap between Davy Island and the main shore, bearing 59° (ENE.) until Kill Bear opens northward of both the Sisters, bearing 93° (E. $\frac{1}{4}$ S.).

Whitchelo Point, of the mainland, is situated a little over 880 yards northward of Carling Rock Lighthouse, and the water is deep between them. From the end of the point the shore trends eastward 1 mile to the southwest entrance point of Kilcourse Bay and is steep-to, there being a good passage between it and Davy Island.

Eagle Rock, with 5 feet water upon it, is the outer end of a very shallow spit extending 590 yards west-southwest from Whitchelo Point. The rock is also 1 mile north-northwest from Carling Rock Lighthouse. It is steep-to on its south and southwest sides and is too far north to affect vessels proceeding to and from Depot or Parry Sound harbors.

Reid Islands, three in number, the eastern one being the largest and thinly wooded; the other two are bare, the southern one attaining a height of 24 feet. The passages between the Reid Islands are fit only for boats. Two rocks with 9 feet water on them lie 250 yards westward from each of the smaller Reid Islands and should be carefully avoided by keeping nearer to Gordon Rock Lighthouse.

Borer Bank, with rocks dry, awash, and sunken, extends in a general north-by-west direction 880 yards from the northwestern Reid Island to a depth of 18 feet.

Buoy.—A red spar buoy is placed northwest of this bank.

Nias Islands are three in number and wooded, the southeastern being 37 feet high. The passage between them and the Reid Islands is not to be recommended.

McClelland Rock, 300 yards northwestward of the largest Nias Island, is small and has deep water close to it.

Beacon.—On this rock is erected a beacon of open slatwork, painted white with red stripe and diamond topmark.

A small rock with 16 feet water on it (in low stages there may be 2 feet less) lies 275 yards east-northeast from McClelland Rock Beacon. This danger is distant 200 yards from Spruce Island Shoal Lightbeacon and nearly in mid-channel.

Buoy.—A red conical buoy marks this danger.

The passage is between this red conical steel buoy and the black spar buoy moored a short distance southward of Spruce Island Shoal Lightbeacon.

Nias Rocks are low and connected to Nias Islands, situated nearly 880 yards southwestward, by a bank with less than 12 feet of water on it. A depth of 15 feet will be found 200 yards northward of Nias Rocks.

Foster Rock, with 11 feet water on it, lies 250 yards southwestward from the extremity of the southeastern and highest Nias Island.

A patch with 15 feet water over it lies 440 yards southeastward of the largest Reid Island, with Jukes Island a little open eastward of the largest Reid Island bearing 347° (N. $\frac{1}{2}$ W.). This is a small round flat rock and can easily be avoided by keeping slightly south of the line joining Gordon Rocks Light and Hugh Rock.

Islands and rocks on the south side of Main Channel.—**Knight Shoal**, with 14 feet water on it, is situated 1 mile southward from Red Rock Lighthouse and a little less than 880 yards southward of the line of the Snug Harbor Range lights. A small rock with 18 feet water on it is situated 275 yards north of Knight Shoal and 440 yards south from the Snug Harbor Range.

Buoy.—A red spar buoy marks the 18-foot spot.

Clarke Rock, with 9 feet water on it, lies nearly $1\frac{1}{2}$ miles 171° (S. $\frac{1}{8}$ E.) from Red Rock Light.

Clearing marks.—To pass eastward of the above rocks and westward of Snake Island Bank, keep Mink Islands Ice House in range with Red Rock Lighthouse bearing 339° (N. by W. $\frac{1}{8}$ W.). To pass westward of all, keep Red Rock Lighthouse in range with the east shore of Shawanaga Bay, bearing about 1° (N. $\frac{1}{4}$ E.).

Snake Island.—This sparsely wooded island, 21 feet high, is situated with its northern extremity $3\frac{1}{2}$ miles southeast by east from Red Rock Lighthouse. This island is 1,175 yards long in a north and south direction, with an average breadth of 150 yards. Numerous islets and dry rocks surround Snake Island, the most conspicuous of

them being a wooded island 100 yards in diameter known as Little Snake Island, situated 350 yards eastward of the middle of Snake Island.

During the progress of the survey, in 1890, 1891, the surveying steamer *Bayfield* anchored in 4 fathoms close to the north side of Little Snake Island, arriving there from Main Channel by keeping its northwest side touching the southeastern extremity of Snake Island, 208° (SW. $\frac{3}{4}$ S.).

Three Star Shoal is the northern sunken rock of the large area of shoal water extending northwestward from Snake Island and called Snake Bank. As little as 4 feet will be found upon the shoalest head of Three Star Shoal, which lies $2\frac{1}{4}$ miles 98° (E. SE. $\frac{3}{4}$ E.) from Red Rock Lighthouse, and $1\frac{1}{4}$ miles 259° (W. $\frac{3}{4}$ S.) from the beacon on Black Rock. It also lies 590 yards southward of the line of the Snug Harbor Range lights.

Light buoy.—A red cylindrical buoy, showing an occulting red light, is moored in 48 feet off the northern end of Three Star Shoal.

Ariel Rock is a formidable danger, with 6 feet water on it, lying 1,175 yards west-southwest from Black Rock. It is separated from the Snake Island Shoals by a lane of water having in it a depth of 11 fathoms. Ariel Rock lies 350 yards southwestward of the line of the Jones Island Range lights.

Buoy.—A red spar buoy marks this danger.

Northeastward of Little Snake Island are several rocky patches with depths on them varying from 7 to 15 feet, the nearest to the line of Jones Island Range being—

Hall Reef, with 13 feet on it, lying 1,175 yards northeast from Little Snake Island, and 440 yards southwestward of the range.

Buoy.—A red spar buoy is moored north of the reef.

Telegram Rock, with 4 feet water on it, is a small spot 350 yards southwestward of the line of the Jones Island Range lights, and nearly 880 yards southward from Twin Rock Beacon.

Buoy.—A red spar buoy is moored northeast of this rock.

Two small rocks, each with 21 feet water upon it, are situated 880 yards northwest by west, and 590 yards west by north, respectively, from Twin Rock Beacon. Both are very close to the Jones Island Range, the former to the northeast and the latter southwest, so that a heavy draft vessel in this locality should slow down and keep the range exactly on.

Light buoy.—A red cylindrical buoy, showing an occulting red light, is moored between Hall Reef and Twin Rock.

Hooper Island, 20 feet high and quite bare, is the northern one of the Bateau Island Group, being connected to the latter by a string of islets and rocks between which there are passages only for boats. A bank makes off in a northeasterly direction 590 yards where there

is a depth of 18 feet, and in a north by east direction where there is a detached patch. with 15 feet water on it (in low stages there may be 2 feet less).

Light buoy.—A red cylindrical buoy, showing an occulting red light, is moored in 18 feet north of Hooper Island.

Gordon Rocks are a small group of bare islets situated 590 yards southwest of Reid Islands, and the north side of them may safely be approached to within 100 yards.

Light.—A fixed white light, 40 feet above water, visible 11 miles, is shown from a white, square wooden structure, on the summit of the northernmost Gordon Rocks. This is the front light of the Jones Island Range.

A small rock, with 15 feet water upon it, lies 350 yards northeastward from Gordon Rocks Lighthouse, and a patch with the same depth is situated nearly 440 yards southeastward of the same. A passage exists between Gordon Rocks and Crow Island by keeping nearer the latter.

Lyon Rocks, of whitish appearance, in three parts and 10 feet high, lie 1,175 yards east-southeastward of Gordon Rocks, and 440 yards southward of the line joining Gordon Rocks Lighthouse and Hugh Rock. The water is good close to the north side of Lyon Rocks, but on their eastern side a shallow bank makes off 300 yards.

Bateau Island is a large island which, together with Sandy Island and the many smaller ones between them, form a group 5 miles long and 2.3 miles broad, and between which the passages are fit only for boats. Bateau Island is thickly wooded, especially on the southwest side, and the abrupt termination of the trees on that side renders it conspicuous as a leading mark in conjunction with Little Snake Island, for the portion of the inside channel between the Minks and Franklin Island.

Between this large group and Snake Island are several dry rocks and numerous shoals with no recommendable channel for a ship, but in an emergency a vessel can get through by keeping the eastern side of Bentley Rock in range with Twin Rock Beacon, bearing 34° (NE. $\frac{1}{4}$ N.). Pass 100 yards southeast of the former, keeping the south point of Pancake Island ahead and Bentley Rock astern, taking care to pass northward of the reef extending 200 yards westward from Bogie Rock, the discolored water of which will be seen from the deck.

Jones Island, 32 feet high, although not near the channel, is of importance as containing the back range light for a portion of Main Channel. For the landing of lighthouse supplies, good anchorage can be had in 3 fathoms over mud on the southeast side, the approach to which is between Ross Point and the small island lying nearly 440 yards eastward of it.

Light.—A fixed white light, 63 feet above water, visible 13 miles, is shown from a white, square wooden structure on a dwelling, on the southwestern point of Jones Island, 2,900 yards 132° (SE. $\frac{1}{2}$ S.) from the light on Gordon Rocks.

This is the rear light of the Jones Island Range.

Range lights.—The lights on Gordon Rock and Jones Island in range bearing 132° (SE. $\frac{1}{2}$ S.) lead from their intersection with the Snug Harbor Range, clear of Ariel Rock, Hall Reef, Telegram Rock, and Hooper Island Reef on the starboard hand, and Black and Twin Rocks on the port hand, to the light buoy moored near Hooper Island.

These lighthouses and those of the Snug Harbor Range show very well on the afternoon with the sun upon them.

Between Jones Island and Hugh Rock are several islands described in connection with Wabuno Channel.

Hugh Rock, 11 feet high and bare, is the outer and smaller of two islands lying close to the western extremity of Rose Island.

Cameron Island is the western and smaller of the two islands lying close to the northwest side of Rose Island, and really appears as part of the latter.

A dry rock close to the shore is situated one-third of the distance from Hugh Rock to Cameron Island, and rocks awash extend from this dry rock 200 yards in a north-northeast direction. A patch with 15 feet water over sand lies northwestward 590 yards from Hugh Rock. A small rock with 16 feet water upon it lies 590 yards west-southwest from the southwestern extremity of Cameron Island.

Cameron Island to Parry Sound Harbor.—The distance between the north point of Cameron Island and the entrance to Parry Sound Harbor is $9\frac{1}{4}$ miles. Cameron Island is situated nearly midway between Red Rock Lighthouse and the harbor, and from Cameron Island to the harbor there is very little difficulty in the navigation. The western 3 miles of this track lies between the coast of Rose together with Parry Island, and the promontory of the main land ending in Kill Bear Point.

Davy Island, 60 feet high and thinly wooded, is separated from the western portion of this promontory by a channel 300 yards wide and depth of 6 fathoms, but from the deck of a vessel appears part of the main shore. A reef makes off the west point of Davy Island 250 yards.

Davy Rock, with 4 feet of water on it, is an extremely small rock surrounded by deep water lying rather over 440 yards south-southwest from the eastern extremity of Davy Island.

Buoy.—A black spar buoy is moored close south of this rock.

Scott Island, 7 feet high, small, and with a few tall trees on it, lies in Kilcoursie Bay, and has been mentioned in connection with the leading mark northwestward of Carling Rock.

Anchorage can be had in this bay northward of Scott Island in 6 fathoms, and a vessel may pass on either side of the latter, which is fairly steep-to.

Cousin Island, 41 feet high, with a few trees on it, lies 440 yards off the Kill Bear Point shore and 1,320 yards westward of Kill Bear Point Light. A vessel may pass northward of Cousin Island, which has deep water on all sides excepting at the western extremity, where a bank extends 350 yards, ending in a rock with 7 feet water on it.

Kill Bear Point is the narrow projection at the termination of the promontory above mentioned; the water south of the point is deep.

Light.—An occulting white light, 37 feet above water, visible 7 miles, is shown from a white, cylindrical, steel structure on the southwestern end of Kill Bear Point.

Anchorage on the east side of this point may be obtained in 6 fathoms over mud.

Sister Islands, two in number, are situated 1 mile eastward of Cameron Island. The northern one is 33 and the other 47 feet high, and both are remarkably clean, there being 10 fathoms close to the north side of the northern one, and a good passage between them, as well as a 5-fathom channel between the southern one and Rose Island.

A narrow island lies 300 yards westward of the south Sister, and a vessel may pass between it and Rose Island. One thousand three hundred and twenty yards westward of the Sisters is a snug little bay in Rose Island in which a vessel may anchor in 3 or 4 fathoms.

Longs Island, 45 feet high, is a picturesque island situated 1,320 yards eastward of the Sisters. Deep water exists between it and Parry Island, off which it lies 200 yards. Between the Sisters and Longs Island is the narrow and shallow entrance to Rose Island Channel. Not more than 6 feet can be carried through this narrow gut; a little blasting, however, would render the entrance safe for a light-draft steamer, which, when through, will find not less than 3 fathoms in the rest of the channel.

Depot Harbor.—From Longs Island the coast of Parry Island runs nearly straight east-southeast, $2\frac{1}{2}$ miles to Cadotte Point, the west entrance point to Depot Harbor, and, with the exception of the first 1,320 yards is remarkably steep-to. Depot Harbor is one of the many excellent harbors in the vicinity of the town of Parry Sound, and takes its name from being the landing place in past years of the supplies for the Parry Island Indians.

There are two entrances to Depot Harbor, one on each side of Depot Island 60 feet high, which shelters the middle portion of the

harbor. The western and main entrance between the island and Cadotte Point, is 440 yards wide and has not less than 6 fathoms water in it.

Depot Harbor is a terminus of the Grand Trunk Railroad and a great grain receiving port employing a fleet of steamers which return with general merchandise. A considerable quantity of coal is also received here for the unloading of which there is a first-class hoist and transporter. Employment is given to a considerable number of men, who with their families formed in 1911 a community of 657. The houses being in a hollow are not conspicuous from the outside, where the most prominent objects are the Roman Catholic church and huge elevator.

The shores of the harbor being steep-to, little more was required than sheet piling to form wharves; a pier, however, 100 feet broad and 400 feet long is built westward in continuation of the northern wharf, partly for additional unloading space, and partly to stop the sea in the east entrance. The depth at this pier in 1919 was 24 feet, at the coal hoist the same, at the eastern end of the north wharf 21 feet, and at the freight sheds wharves on the south side 24 feet. At the broad pier between the two arms of the railroad the depth is 21 feet. In low stages there would be $1\frac{1}{2}$ feet less.

Light.—A group flashing white light, 25 feet above water, visible 6 miles, is shown from a white square wooden structure, on the beach at the western end of Depot Island.

Storm signals.—The usual storm warnings are hoisted on a mast placed on Supply Point.

Skiff Rock, with 4 feet water on it, lies 590 yards northeast from the later point, and should be passed westward of.

A sort of inner harbor exists southwestward of Cadotte Point, and to enter it with 24 feet water keep between the latter and the larger of the two islands separating the inner and main harbors, and anchor off Hangcliff Point in 6 fathoms.

Three Mile Point.—From Supply Point the shore of the sound takes an abrupt turn northward for a little over 2 miles to Three Mile Point, the northern extremity of Parry Island, nearly 4 miles eastward from Kill Bear Point. It derives its name from being about 3 miles from the town of Parry Sound. A rock with 13 feet water on it is reported to lie about 200 feet from the light; the point, therefore, should not be hugged too closely. Otherwise the point has deep water close to it, and between it and Gull Rock is a deep hole about 1 mile in diameter with as much as 61 fathoms.

Light.—An occulting white light, 38 feet above water, visible 7 miles, is shown from a gray, cylindrical tank on a concrete base, on Three Mile Point.

Two Mile Point, being about 2 miles from the town, has the same bold character as the last mentioned, excepting on the east side where a rock with 10 feet of water on it lies 440 yards southeast from the point.

Shoal Point is the next southeast of Two Mile Point, and, as indicated by its name, has shoal water extending from it northeastward 300 yards, which should be guarded against in proceeding to the harbor.

Indian Creek is a long indentation between the last mentioned and Two Mile Point. Small tugs proceed through this creek into a lake lying between Depot Harbor and the Indian Village.

Belle Bay is an indentation immediately southward of Shoal Point in which will be found good water close to the shores.

Deepwater Point is the southwest entrance point of Parry Sound Harbor, and, as its name would suggest, has good water close to it, as much as 24 feet being found between the point and the flat from Bobs Point; the land immediately behind Deepwater Point rises to a height of 102 feet.

Bobs Point is the east entrance point of Parry Sound Harbor, and a flat extends 120 yards from it in the direction of the southern part of Deepwater Point.

Buoys.—A black spar buoy marks the western edge of Bobs Point Flat, and a similar buoy is moored on the southeast side of Bobs Point and about 200 yards southwest of the outer end of the town wharf.

Silbow Rock, 4 feet high, lies close to the main shore and a little over 880 yards northwest of Bobs Point.

McKerrel Rock, with $13\frac{1}{2}$ feet water on it, lies a little more than 440 yards westward from Silbow Rock, and a heavy draft vessel should not pass between them. When on the rock, the Peter Estate Lumber Co.'s burner is open a little southward of Deepwater Point.

Buoy.—This rock is marked by a black spar buoy.

Parry Sound Town and Harbor.—The town, with a population of 3,429 in 1911, has railroad communication by means of the Grand Trunk, Canadian Pacific, and Canadian National Railroad Cos. It possesses two sawmills in active operation, that on Bobs Point being the Conger Co. and that on the south shore of the harbor belonging to the Peter Estate. The buildings of the late Parry Sound Lumber Co., 440 yards above the mouth of Seguin River are still standing, as is also the burner of the sash and box factory in the northeast corner of the harbor.

The iron railroad bridge of the Canadian Pacific Railroad crosses the river about 300 yards in from its mouth.

It has branches of the banks of Nova Scotia, Commerce, and Toronto, and is the headquarters of the Marine and Fisheries De-

partment for the Great Lakes, the wharf, with depth of 15 feet near the outer end, being situated outside the harbor and over 590 yards northward from Bobs Point; it is also the chief customs port for the northeast shore of Georgian Bay. The Canadian Explosives Co. (Ltd.) have a large explosive plant in a locality 5 miles northwest from the town.

Parry Sound Town has daily steamboat connection with Midland and Penetanguishene by Sound Channel. It contains a good water supply, stores of all kinds, and churches of all denominations. The Belvidere summer hotel, together with the Marine Agency, Standard Chemical Works, and Smelter, are the most conspicuous buildings seen in approaching the harbor.

Storm signals are exhibited from a mast on Bobs Point Wharf.

The entrance to Parry Sound Harbor between Deepwater Point (Parry Island) and Bobs Point is 250 yards wide, but for heavy draft vessels the navigable channel is further contracted to half that width by Bobs Point Flat.

The depth in the channel close to Deepwater Point is 4 fathoms. The harbor may be said to be comprised between the entrance points and the Indian village $1\frac{1}{4}$ miles southwestward, making an area of about 370 acres. The shores have deep water close to them and are in every way suitable for wharfage.

The northern portion of the harbor at the mouth of Seguin River is shallower than any other part, caused by sawdust and sand, which no doubt can be removed by dredging.

Town wharf.—From the northwest entrance point of the river a wharf extends in a southwest by south direction 300 yards, with a depth of 16 feet (1919).

A rock with 10 feet water on it lies southeast of Bobs Point and 200 yards from the eastern shore of the harbor.

Buoy.—A red spar buoy marks this rock.

Rosetta Island, 48 feet high, lies 200 yards from Parry Island and 880 yards southwest of the harbor entrance and has deep water close to its eastern side. A rock with 13 feet water over it, lies 300 yards westward from the south point of Rosetta Island.

Indian village.—This settlement is situated near the shore of the deep indentation between Rosetta Island and Salt Point; the latter being named after the Indian Methodist missionary residing here in 1891.

A rock with less than 6 feet water on it lies 250 yards eastward from the northeastern extremity of Salt Point.

Sloop Island, small and 7 feet high, with trees on it, is situated at the south corner of the harbor, and is 1 mile from the town at Parry Sound. Shoal water extends 100 yards from its north and

northeast sides, and a channel with 12 feet water separates it from Jenkins Point, from which it is about 70 yards. The shallow draft steamer using South Channel usually take this narrow passage.

Buffalo Island is situated a little more than 590 yards south of Sloop Island close northward from Rose Point.

Thompson's Wharf is situated off the large hotel on the southwest side of the point just east of Buffalo Island. Steamers going south are not to leave this wharf until the bridge is open.

Rose Point Swing Bridge.—Rose Point is the long, narrow point about 150 yards south of Buffalo Island, and it is here the Grand Trunk Railroad Co. have erected a swing bridge by which to reach Parry Island and Depot Harbor. The swing pier is placed 275 feet from Rose Point and 450 feet from Parry Island. On each side of the pier is an opening 60 feet wide.

A good wharf also has been built on the north side of Rose Point for the convenience of passengers transferring from the railroad to the ferry for Parry Sound. A depth of 11 feet of water will be found at this wharf at low stages.

Bridge signals.—Masters of vessels wishing to pass the bridge should stop at Sloop Island from the north, or off the northeast point of Isabella Island if from the south, and signal three prolonged whistles. A mast placed upon the center of the pier exhibits from its top at a height of 70 feet above the water a red and white ball 4 feet in diameter when the channel is clear. When the ball is down on the bridge navigation is closed. On no account should a vessel approach the bridge nearer than above until the signal is made that the channel is clear.

Lights.—A light showing green up and down channel when the bridge is open and red when closed is shown from the bridge.

Directions—Seguin Bank Lightbuoy to Depot Harbor and Parry Sound Harbor.—The course and distance from a position 590 yards south of the south point of Flowerpot Island to Seguin Bank Lightbuoy is about 87° (E. $\frac{3}{4}$ S.) 54 miles. From North Channel of Lake Huron the course from Papoose Island is about 131° (SE. $\frac{3}{4}$ S.) and distance 55 miles. From Owen Sound the course from abreast Squaw Point to Red Rock Lighthouse is 26° (NE. by N.) and distance 56 miles.

When nearing Seguin Bank Lightbuoy pass south of it and edge a little northward to bring the Snug Harbor lighthouses or lights in range bearing 71° (E. by N.) The distance between Seguin Bank and Three Star Shoal lightbuoys is $7\frac{1}{2}$ miles. If the weather is too thick to discern these range lighthouses, but clear enough to see Red Rock Lighthouse, the latter should be kept between the bearings of 66° (ENE. $\frac{1}{2}$ E.) and 1° (N. $\frac{3}{4}$ E.) until the weather clears up, to

avoid Richmond Rock on the north side of the track and Clarke Rock on the south side.

The Snug Harbor Range should be kept until 440 yards northeast of Three Star Shoal Lightbuoy, when a vessel should be ready to turn gradually to the southeast and steer for Jones Island lights in range bearing 132° (SE. $\frac{1}{2}$ S.).

This range should be kept for 3 miles or to within 440 yards of Hooper Island Lightbuoy. On this range the lightbuoy moored between Hall Reef and Twin Rock must be passed close north.

Now, passing also northward of Hooper Island Lightbuoy, turn slowly and steer 88° (E. $\frac{1}{2}$ S.) for Spruce Island Shoal Lightbeacon, with Hooper Island Lightbuoy astern. Pass close south of the black spar buoy moored a short distance south of Spruce Island Shoal Lightbeacon, and northward of the red conical buoy marking the 16-foot spot lying east-northeast of McClelland Rock.

Caution.—The channel here is very narrow and a vessel at night should proceed slowly.

When east of the last-mentioned red conical buoy, haul northward and steer 59° (NE. by E. $\frac{1}{4}$ E.) for Scott Island in the gap between Whitchelo Point and Davy Island, or with Carling Rock Light a little on the starboard bow.

If proceeding to Parry Sound Harbor, the distance and course from Kill Bear Point to Three Mile Point Light is 4 miles 73° (E. $\frac{1}{4}$ N.). After passing Two Mile Point, bring Bobs Point just open north of Deepwater Point bearing about 111° (SE. by E. $\frac{1}{4}$ E.) to pass between McKerrel Rock and the spit from Shoal Point. The Deepwater Point shore should be kept best aboard in entering the harbor to avoid the spit from Bobs Point.

Caution.—When leaving Parry Sound Harbor, before heading for the outlet, take care to be well over to the southeast part of the Deepwater Point shore and keep it close on board.

Depot Harbor to Seguin Bank Lightbuoy.—There are no dangers eastward of Sister Islands, after passing northward of which keep Kill Bear Point just open north of the north Sister Island 92° (E. $\frac{1}{4}$ S.). Pass north of Carling Rock red spar buoy, and steer midway between McClelland Rock Beacon and Spruce Island Shoal Lightbeacon.

Pass north of the red conical buoy marking the 16-foot spot east-northeast from McClelland Rock and south of the black spar buoy moored a short distance south of Spruce Island Shoal Lightbeacon.

Now steer 268° (W. $\frac{1}{4}$ N.) for Hooper Island Lightbuoy ahead. Pass northward of the latter and steer 312° (NW. $\frac{1}{2}$ N.) with the Jones Island range lights in range astern. After passing Black Rock Beacon a sharp lookout must be kept for the Snug Harbor range

lights so as to bring them in range astern bearing 71° (E. by N.) as soon as possible.

If the Jones Island Range were kept too long, a vessel would be in danger of striking Vankoughnet Ground.

The Snug Harbor Range should now be kept as far as Seguin Bank Lightbuoy if bound northwest or west; if southwestward or southward, a vessel by day may leave the range when Red Rock Lighthouse is in range with the east shore of Shawanaga Bay bearing 1° (N. $\frac{1}{4}$ E.), which mark leads westward of Knight Shoal and Clarke Rock.

Caution.—The soundings in the approach to Parry Sound are too irregular to be much guide in thick weather, and great caution is consequently necessary under such circumstances.

Patterson Island, 27 feet high and wooded, lies 300 yards off the northeast coast of Kill Bear Promontory 1 mile north of the northeastern extremity of Kill Bear Point. It is connected to the coast by dry rocks and shallow water, but its eastern side is steep-to.

Ouimet Point, the southwest entrance point of Blind Bay, is situated 1 mile northwest of Patterson Island and is steep-to, as is the bight between them.

Blind Bay is the first indentation northeastward of Kill Bear Promontory, and from Ouimet Point to the bottom is $2\frac{1}{2}$ miles in length. The shores are about 100 feet in height and wooded, and the whole bay forms an excellent harbor with no dangers excepting a rock with 4 feet water on it 200 yards from the northeast shore and 880 yards from the bottom of the bay.

Collins Bay is the next inlet northeastward of Blind Bay, its length from the entrance points being $1\frac{1}{2}$ miles. Middle Island, 15 feet high, so named on account of its being in the middle of the bay, is the only island in it and has a passage on each side of it, that on the northeast side being the deeper and more direct of the two.

The bottom of Collins Bay is not closed, but connected by a narrow channel to a sheet of water called Deep Bay, but to which the survey did not extend.

Loon Bay is the third arm northeast from Kill Bear Promontory and runs in nearly 2.6 miles. There are six islands in this bay, the larger one of the two just separated and dividing it from Collins Bay being known as Johnson Island, 50 feet high. Hailstone and Loon islands lie nearly in the middle of the bay and good passages exist on both sides, that between Loon Island and High Bluff being limited in width to 150 yards. Anchorage may be had in 6 fathoms between Loon Island and the two thinly wooded islands near the bottom called Giffen Islands.

Smith Bay is the next long indentation northeastward of Loon Bay. There are patches of good land in this locality cultivated by

farmers living there, and in Dent Bay the next indentation south-westward. Vessels can enter Smith Bay by the passages on either side of Goat Island, but if passing southwestward of Goat Island take care to avoid a sand spit making off 50 yards from the latter by keeping nearer to the Alves Point shore.

Good anchorage can be had in 5 fathoms at the place indicated by the anchor on the chart. The narrow passage between Goat Island and Grave Island immediately east of it is fit only for small boats.

Blairs Landing, called after the present occupant (1891) of the farm house at the mouth of the stream on the north side of the bay, contains good anchorage in 5 fathoms off the gravel bank at the mouth of the stream. There is a post office here, the official name of which is Carling, on the boundary of which township Blair's landing is situated.

Islands between Kill Bear Point and Blairs Landing.—**Mowat Island** has a decided summit, 143 feet high, and the water is deep close to its south and east shores. Muriel, Bar, and other islands encircle its northern side, and give shelter to a snug little bay with anchorage in 4 fathoms, indicated by the anchor on the chart.

There is no passage for a ship between Muriel and Mowat islands, and the channel between Mowat and Bar islands has a depth of only 9 feet, but the two passages eastward of Bar Island are good, that immediately eastward of Bar Island being the deeper.

Spectacle Island, about 100 feet high and wooded, derives its name, no doubt, from the narrow isthmus almost separating the larger portion from the smaller, which contained in 1891 a summer residence.

There is no passage between Spectacle and Shoal islands, but between the former and Long Island a depth of 15 feet can be carried by keeping close to Long Island.

Green Island is connected to Long Island by a gravel bank on which there is not more than 9 feet water. A deep-water passage will be found between Green and Spectacle islands on the north, and the Mowat Island group on the south.

Horse Island is a round, black-looking island about 150 feet high. The passage between it and Green Island is contracted by a couple of dry rocks—one on either side—to a width of 300 yards and depth of 8 fathoms.

Passage Island, bare and 16 feet high, lies midway between Muriel and Horse Islands. It has rocky spurs extending 50 yards off its north and east points, but is otherwise steep-to with good passages on either side.

Huckleberry Island, including Wall Island, is $2\frac{1}{4}$ miles long, with a greatest breadth of $1\frac{1}{2}$ miles. It is wooded and about 150 feet

high, and a glance at the chart will show that with one exception the north and east sides are steep-to.

Tranch Rock, awash, lies 590 yards eastward from the northern extremity of Horse Island, and should be carefully avoided by a vessel using the channel between Horse and Huckleberry Islands.

Collins Reef is a shallow, rocky bank extending 440 yards from the northwest side of Huckleberry Island. This shoal, together with Dent Rock, with less than 6 feet water on it, almost block the passage between Huckleberry Island and the main shore, but, with a buoy on the western side of Collins reef and one on Dent Rock, a depth of 4 fathoms can be carried between them, and 3 fathoms between Dent Rock and the main shore.

Hole in the Wall is a remarkable cleft separating Huckleberry and Wall Islands. The narrowest place is 111 feet wide and depth of water 13 feet (in low stages there may be $1\frac{1}{2}$ feet less). Tourist steamers running through this picturesque channel should take care to avoid a rock nearly awash at the western entrance, by keeping Wall Island pretty close on board. Rocks lie 300 yards off the south point and southwest side of Wall Island.

McIlray Island is the western and lower of two islands lying 880 yards southeastward of Blairs Landing. A rock awash lies 150 yards southwest of McIlray Island, but leaving a passage with a depth of 5 fathoms between it and Huckleberry Island.

Elizabeth Island, about 70 feet high and thinly wooded, is separated from the eastern shore of the sound by a narrow channel with a depth of 6 feet over mud. The bight between Blairs Landing and Elizabeth Island is indented by several small circular beaches, and, although the bottom in this bight is uneven, nothing of a very shallow nature was discovered. Deep water approaches close to the south point of Mary Island lying just clear of the south end of Elizabeth Island.

Partridge Island, round and 37 feet high, is a conspicuous feature standing well out in the passage between Elizabeth and Huckleberry Islands, with deep water all round it.

A bank stretches off from Elizabeth Island toward Partridge Island, 300 yards from which there is a depth of 3 fathoms; by keeping close to the latter island, however, a depth of 14 fathoms may be carried through between it and the west edge of the bank.

Gull Island, 17 feet high and quite bare, is a remarkably clean rock, 1,175 yards southward of Partridge Island. The deep water close to it and the neighboring islands render it a good site for a beacon in connection with the testing of a vessel's compass error.

Beacons for ascertaining compass errors.—A beacon is erected (1891) upon the summit of Gull Island as the common object for the following magnetic lines. On the east coasts of Wall and Huckle-

berry islands are erected two beacons with the letters "W." and "N. W.," painted on them. On Partridge Island is placed a beacon with the letter "N." painted on it, and on the northwestern extremity of Mary Island stands another with the letters "N. E." marked on it. On the east shore of Bowers Bay is erected a fifth beacon with the letter "E." painted upon it.

Gull Island Beacon in range with the above mentioned, points out the magnetic directions indicated by the letters. Gull Island Beacon in range with the turret of the Belvidere Hotel, bears 125° (SE. $\frac{1}{4}$ E.); in range with the lightbeacon on Three Mile point, 177° (S. $\frac{3}{8}$ W.); and brought in line with the south extremity of Wall Island, bears 240° (W. S. W.).

Note.—These magnetic directions were laid off in the year 1891, since which date there is probably a difference of a degree caused by the annual change.

Bowers Bay is a large indentation eastward of Gull Island, in the northern part of which are two well-sheltered coves, the western one affording good anchorage in 5 fathoms and well adapted for wharves. The deepest channel into Bowers Bay is between Galna Island and Duncan Point, by which 7 fathoms can be carried by keeping close to the Duncan point short to avoid the bank extending 300 yards northeastward from Galna Island.

A rock with 7 feet of water lies 150 yards off the south point of this island, and another with the same depth is situated 440 yards north-northwest from Galna Island, or nearly mid-distance between it and Robertson Island.

A passage into Bowers Bay can also be had northward of Robertson Island with not less than 15 feet water (1891).

From Duncan Point the shore trends southeastward with a slight outward curve a little more than $1\frac{1}{2}$ miles to the smelter and the pump house for Parry Sound waterworks, and has good water fairly close to it.

Outside islands from Red Rock Lighthouse to Lone Rock—Snake Bank.—This dangerous area of shoal water has been alluded to in connection with Main Channel, and the shoals lying westward of the continuous bank will now be particularized—

Drever Rock, with 8 feet least water on it, lies $1\frac{1}{2}$ miles southeast from Red Rock Lighthouse; a depth of 10 fathoms will be found 300 yards westward of this danger, and there is a channel over 1,320 yards wide with depth of 16 fathoms between this rock and Clarke Rock.

Wallace Rock, with $13\frac{1}{2}$ feet water on it, is the most westerly danger of the Snake Island Shoals. It is 2.3 miles south-southeast from Red Rock Lighthouse, and a depth of 10 fathoms will be found 150 yards westward of this rock.

Cuba Rock, with 9 feet of water on it, is a dangerous obstruction on the same bearing from the lighthouse, distant rather over $2\frac{1}{4}$ miles.

Bayfield Rock, with 12 feet water on it, lies 440 yards south-southwest from Cuba Rock, and is usually marked by a ripple.

Clearing mark.—Red Rock Lighthouse in range with the ice house at The Minks, bearing 339° (N. by W. $\frac{1}{2}$ W.) leads 440 yards southwestward of Bayfield Rock and all the Snake Island Shoals.

Cathcart Island is one of the most conspicuous islands on the western side of the Bateau and Sandy Island group. The ground is only 7 feet high but its trees give it a higher appearance; it is $3\frac{1}{4}$ miles south-southeast from Snake Island and $2\frac{1}{4}$ miles northwestward from the southwestern extremity of Sandy Island.

Araxes Bank, with 12 feet of water on it, is situated over 1,320 yards westward of the Cathcart Group.

Claude and Amelia Rocks, 3 feet high and dark in color, lie 440 yards apart north and south. They are the most outstanding dry rocks in this locality, and situated nearly 1 mile southwestward of Cathcart Island.

A bank with 12 feet water on it, lies 440 yards westward of Amelia, the southern of these two black looking rocks.

Beatrice Bank is the southern portion of the shallow bank extending $1\frac{1}{2}$ miles southward from Cathcart Island, and on this bank is a rock with less than 6 feet water on it lying 590 yards south-southeast from Amelia Rock.

Sandy Island, so called from the nature of its soil and the beach on the southeast side, is the largest island of this group, being 2.6 miles long, with greatest breadth of $1\frac{1}{4}$ miles; it is well covered with timber.

Coote Island is a compact-looking island 300 yards in diameter, covered with high conspicuous pine trees and lying 440 yards south from the south side of Sandy Island.

Capel Rock is a rather conspicuous bare islet, 14 feet high, situated nearly 880 yards west from Coote Island.

Quilliam Shoal, with 15 feet water on it, is one of the most outlying spots in this locality and situated 2 miles westward from Coote Island.

Cornwallis Rock, with 9 feet of water over it, lies $1\frac{1}{2}$ miles west by south from the same.

Umbrella Islands (Umbrellas) are a group which derive their name presumably from a single large pine tree growing upon one of the inside islets of the group, and from that circumstance called Tree Island. The northwest island is the largest and has some tall trees upon it, the ground being 15 feet high. The Umbrellas are situated $3\frac{1}{2}$ miles southward of Sandy Island, being almost connected thereto

by a chain of islets, rocks dry and sunken, with no passage for a vessel.

The cluster nearest Sandy Island, called Baker Group, is composed of bare rocks some of which are 11 feet high, the cluster occupying a space of nearly 1 square mile.

Tribune Island, 10 feet high, is the southern island of Baker Group.

Hood Patch, with 15 feet water over it, lies $1\frac{1}{4}$ miles westward from Tribune Island.

Vanguard Rock, small and 2 feet above water, is situated 1,320 yards westward from the northwest wooded island of The Umbrellas, and another little rock just showing above water lies 440 yards southeast from Vanguard Rock.

Caution.—In thick weather a vessel should not stand into less than 20 fathoms between the Snake Island Shoals and Vanguard Rock.

Umbrella Ledges take their name from Umbrella Islands, which they lie southwest and south of. As there is no passage between the shoal spots on this bank, only the outside dangers will be particularized.

Southeast Rock, 12 feet high, lies, as its name indicates, 1,320 yards southeast from the northwestern and highest Umbrella Island.

Southwest Shoal, with 14 feet water on it, bears 235° (SW. by W. $\frac{1}{2}$ W.) and is $1\frac{1}{4}$ miles from Southeast Rock. As this patch is only 350 yards outside two rocks with 3 feet water on them, a vessel should not approach this locality from the west to a less depth than 20 fathoms, which will be found only 200 yards off Southwest Shoal.

Ricketts Reef, with 12 feet water on it, lies 1,320 yards southeastward from Southwest Shoal and $1\frac{1}{4}$ miles southwest from Southeast Rock. A spot with 10 feet water on it lies 300 yards northward of Ricketts Reef.

Gladwyn Rock, with 9 feet water on it, is a dangerous obstruction lying a little more than $1\frac{1}{2}$ miles southward from Southeast Rock.

Umbrella Ledges are connected to the Lone Rock Shoals by a series of banks under the depth of 10 fathoms, the shoalest spot being—

Beaver Rock.—This shoal, with a depth of 13 feet over it, lies 590 yards westward of the Wabuno Channel track and $1\frac{1}{4}$ miles northward from Lone Rock light buoy.

A patch with 18 feet upon it is situated 1 mile northwest by north from the buoy.

A patch with 16 feet on it lies 440 yards southwest from Lone Rock, and a rock with 7 feet on it 590 yards south by east from the same.

Ouida Rock, with 7 feet water on it, lies in the latter direction 1.1 miles from Lone Rock.

Wabuno Channel.—This is the name given to the passage eastward of the Umbrellas and westward of Parry Island. From Lone Rock on the south to Rose Island on the north, the length of the passage is $11\frac{1}{2}$ miles with a depth of 15 feet (in low stages there may be 2 feet less).

To a vessel bound to Parry Sound or Depot Harbors from Midland, the use of this channel saves a distance of $12\frac{1}{2}$ miles, but on account of the narrowness in some places, is totally unfit for a sailing vessel.

Features and dangers on the western side of Wabuno Channel from the junction with Main Channel.—Duke Island, small, 10 feet high, and with a few trees on it, is the northeasternmost of the group which extends in the latter direction $1\frac{1}{2}$ miles from the north point of Sandy Island. A low dry reef extends 100 yards from the northeast side, and one of a similar character makes off the same distance from the opposite direction.

There is a passage on either side of Duke Island, the one between it and Rose Island with 13 feet over sandy bottom called Albert Channel being the one hitherto used. The passage southwest of Duke Island known as Clarence Channel has, however, a depth of 15 feet over rocky bottom (in low stages there may be 2 feet less) and is the one recommended and now generally used.

Owen Island, oval shaped and wooded, is situated 200 yards from the dry reef lying close to the southwestern extremity of Duke Island, and between them is Clarence Channel.

Hecla Rock, with 6 feet water on it, lies 270 yards eastward from the north point of the dry reef lying close to the northeast side of Duke Island, and not more than 9 feet over sand can be carried between them.

Palestine Island, about 50 feet high and partly wooded, is the largest of the group to which Duke and Owen Islands belong. It derives its name from the circumstance of its having formerly been used as a rearing place for bees from that country, a reminder of which is a couple of hive-shaped houses still (1891) remaining near the northeastern side of the island. Close to the latter side of Palestine Island the water is deep.

Sandy Island.—The east coast of Sandy Island between Ross Point and Martyr Islands is broken up by three long but shallow bays, and the coast is fringed by a broad sand bank under the depth of 3 fathoms, which northeastward of Martyr Islands rises very abruptly from a depth of 9 fathoms over mud.

Martyr Islands, nine in number, lie off the southeast side of Sandy Island, being separated from the low eastern point by a shallow passage 275 yards broad. The group is wooded, the highest island attaining an elevation of 19 feet.

Anchorage.—For the convenience of carrying on the survey in 1890, 1891, the survey steamer *Bayfield* found good anchorage and shelter in 14 feet over mud between the Martyr Group and Sandy Island, and 250 yards north of Harbor Reef, the passage being between the latter and the southwestern Martyr Island, care being taken to avoid the sunken rocks lying 300 yards southward of Martyr Islands.

Sceptre Bank, awash, is situated 590 yards west from the south point of Oak Island. Several other shoals lie between Sceptre Bank and the broad shallow sand bank from Sandy Island, but as they are not near the track they will not be particularized.

A small rocky patch with 13 feet water over it lies approximately a little over 440 yards west-southwest from the southwestern extremity of Oak Island and 300 yards southeast of Sceptre Bank.

Buoy.—This patch is marked by a black spar buoy.

Niger Rock, just covered, is an equally dangerous obstruction lying 440 yards southwest from Iron Rock Beacon, the track being between them.

Buoy.—A black spar buoy is moored east of Niger Rock.

Campbell Rock, 32 feet high, with deep water close to its east and southeast sides, lies on the western side of the ship's passage, and is 170 yards from Good Cheer Island. The navigable channel, however, is narrowed to half that width by a rock in mid-channel with 7 feet water on it, leaving a depth of 4 fathoms between it and Good Cheer Island by keeping close to the latter.

A depth of 18 feet can be carried through westward of this danger by keeping Campbell Rock close on board, but the passage on the Good Cheer Island side is wider and therefore the one recommended.

Sister Rock.—From Good Cheer Island to Sister Rock the ship channel for $1\frac{1}{2}$ miles is between islands difficult to describe intelligently to a stranger, who should take a pilot for the first time through all these channels.

Beacon.—A large white slatwork beacon, surmounted by a red triangle (indicating that a vessel should pass westward of it), is erected upon Sister Rock. The channel westward of the beacon is 200 yards wide.

Light.—An occulting red light, 60 feet above water, visible 10 miles, is shown from a red skeleton structure on the summit of Sister Rock, Wabuno Channel.

From Bath Islands, lying 200 yards westward of Sister Rock, a reef extends in a north-northeast direction 250 yards from the last dry rock, terminating in a depth of 11 feet.

Clearing mark.—To pass southeast of this reef, keep the northwest side of Taylor Island, touching the southeast side of Bath Islands, bearing 197° (SSW. $\frac{1}{4}$ W.).

Another mark for leading over the deepest water here is to keep the west side of the clean little wooded island called Range Island in range with the narrow gap eastward of Skunk Island, bearing about 5° (N. by E. $\frac{1}{2}$ E.).

Southward of Sister Rock Wabuno Channel becomes more open.

Taylor Island, 15 feet high, with a rather conspicuous bush on its top (in 1891), is a round island lying 1.3 miles south-southwest from Sister Rock Light Beacon and rather over 590 yards westward of the vessel's track.

Doty Rocks consist of two distinct patches with 4 and 6 feet of water on them, the latter and outer spot lying 440 yards east-southeast from the middle of Taylor Island.

Buoy.—A black spar buoy is placed close east of the 6-foot patch.

Gull Rock is a conspicuous and important feature in the channel. The top of the rock is $7\frac{1}{2}$ feet above the mean summer surface of 1891, corresponding to $580\frac{1}{2}$ feet above mean tide level at New York.

Beacon.—Upon Gull Rock is erected a white beacon with a black square as topmark.

With the exception of a shallow spur making off 50 yards from its northeast side, Gull Rock is steep-to and therefore very serviceable as a mark to steer for. It bears 185° (S. by W. $\frac{1}{8}$ W.) and is $2\frac{3}{4}$ miles from Sister Rock Light Beacon and 5° (N. by E. $\frac{1}{2}$ E.) $3\frac{1}{4}$ miles from Lone Rock. In fact, the three objects are as nearly as possible in range.

Dehring Rock, small and with less than 6 feet water upon it, is an ugly danger situated 1,320 yards southwest by south from Gull Rock and 590 yards westward of the track.

Buoy.—A black spar buoy is moored eastward of this danger.

Islands and dangers lying off the west coast of Parry Island, bordering the eastern side of the track.—**Pell Island**, over 590 yards in diameter, almost blocks the southwest entrance to Rose Island Channel; there is, however, a narrow passage with depth of 3 fathoms by keeping close to the southeast coast of Pell Island, leading to good anchorage northeast of the latter. Pell Island is situated 880 yards east of the southwestern extremity of Rose Island, and the same distance north of Liddon Point.

Griper Bank, with 9 feet water on it, is the westerly termination of the shoal bank extending 590 yards from the point about midway between Liddon Point and Oak Island, and 440 yards eastward of the ship's track.

Trent Rock, with 7 feet least water upon it, lies a little more than 880 yards north from the southwest end of Oak Island and 200 yards eastward of the ship's track.

Oak Island, 14 feet high and with the kind of timber on it indicated by its name, is the nearest island to the ship's track after leaving

Palestine Island in proceeding south, and the exceptional character of the timber renders it unmistakable.

Beacon.—The southwest point of the island is marked by a white slatwork beacon surmounted by a cross.

A bank makes off in a southwesterly direction 250 yards from the southwest portion of Oak Island.

Clearing marks.—To pass westward of Griper Bank, Trent Rock, and the bank from Oak Island, also eastward of Sceptre Rock, keep the western extremity of Rose Island—a low cliffy point—in range with the east side of Palestine Island, bearing about 2° (N. $\frac{1}{4}$ E.). Another mark that will also serve at night is Carling Rock Light just touching the east side of Palestine Island on the same bearing.

Caution.—This leading mark leads over a 13-foot patch marked with a black spar buoy. A vessel should therefore pass east of the buoy.

The coast of Parry Island between Oak and Good Cheer Islands is very much broken up.

Iron Rock—Beacon.—Iron Rock, 5 feet high, on which is erected a white slatwork beacon surmounted by a red triangle, is the most outstanding islet between Oak and Good Cheer Islands. The water is deep close to Iron Rock excepting at the southwest end, whence a shallow spur puts off 50 yards. Niger Rock with its buoy previously described and the ship's track is between the latter and Iron Rock by keeping Sister Rock Lightbeacon in range with the southwest point of Good Cheer Island (usually marked by a flagstaff), bearing 160° (S. by E. $\frac{1}{4}$ E.).

Good Cheer Island is 880 yards long east and west and 200 yards broad, and the ship's passage is close to the two points on its western side, which fall steeply to a depth of 4 to 5 fathoms.

A narrow and tortuous channel exists eastward of Good Cheer Island, and is sometimes used by shallow draft steamers from Parry Sound Harbor to Midland in conjunction with Wabuno Channel, but owing to the immense amount of absolutely necessary work, together with the deepening of South Channel, it was not considered justifiable to include this passage in the survey. Suffice it to say that this inner passage is locally known as the Long Sault, that the north entrance is east of Good Cheer Island, and southern entrance southward of Campbell Island (not the rock), an approximate length of $3\frac{1}{2}$ miles.

Sarah Island, 15 feet high, is the next conspicuous feature on the east side of Wabuno Channel after emerging from the confined water between Good Cheer Island and Sister Rock Lightbeacon, and lies 440 yards eastward of the track. A depth of 10 fathoms will be found 100 yards westward of Sarah Island.

Rigby Island, 17 feet high, perfectly bare, with a small dome-shaped top, lies nearly $1\frac{1}{2}$ miles southward of Sarah Island and 1,320 yards northeast by east from Gull Rock. There is no passage for a vessel eastward of either of these islands.

Caleb Island, 14 feet high and very similar in character to the last described, is situated 1.2 miles east-southeast from Gull Rock. A reef with depths less than 6 feet extends nearly a quarter of a mile south from the island.

Sitric Rock, with 9 feet water over it, lies over 590 yards south-southwest from Caleb Island, and there is no passage between them.

Directions for Wabuno Channel.—The course and distance from the position 1 mile eastward of Hope Island Lighthouse to 880 yards westward of Lone Rock Light and Bell Buoy is 343° (N. $\frac{3}{4}$ W.), $16\frac{1}{4}$ miles. Having picked up the buoy, pass 200 yards west of it, and bring Gull Rock Beacon a quarter of a point on the port bow steering 12° (N. by E. $\frac{3}{4}$ E.) until 200 yards eastward of the latter. Then head for Sister Rock Light Beacon 2° (N. $\frac{1}{4}$ E.) passing eastward of Doty Rocks Buoy.

When Sister Rock Light Beacon is reached, pass midway between it and Bath Islands; when 300 yards northward of the light beacon see that the west side of Range Island is in range with the gap east of Skunk Island, bearing 5° (N. by E. $\frac{1}{4}$ E.) or, that the northwest side of Taylor Island astern is touching the southeast side of Bath Islands just past, 197° (SSW. $\frac{1}{4}$ W.).

Haul northwestward so as to pass 150 yards southwestward of Range Island, and keep mid-channel between Skunk Island and the string of islands westward of it. Campbell Rock and Good Cheer Island will now be in sight, and the passage between them should be steered for. Keep the western side of Good Cheer Island close on board to avoid the 7-foot rock in the middle of the passage. When through, keep Sister Rock Light Beacon in range with Boyd's Flag Staff (if still standing) astern, bearing 160° (S. by E. $\frac{1}{4}$ E.).

When 1,175 yards northward of Iron Rock Beacon the eastern side of Palestine Island, the western cliffy point of Rose Island, and Carling Rock Light will be all in range and should be steered for bearing 1° (N. $\frac{3}{4}$ E.), which will lead in 3 fathoms up to the east coast of Palestine Island, near which the water is deep. Keep 440 yards east of Palestine Island so as to make an easy curve around the small islet at its northern extremity, and proceed through Clarence Channel between Owen and Duke Islands with 15 feet water (at low stages there may be 2-feet less).

When through, haul gradually northward to pass 440 yards westward of Hugh Rock and the same distance westward of Rose Island until abreast the northeastern extremity of Cameron Island, whence proceed for Parry Sound Harbor as before directed.

Caleb Island to Starvation Bay.—A smooth inside passage with depth of 11 feet (in low stages there may be 2 feet less) exists between these places, and is used by the Midland and Parry Sound light-draft steamer, in conjunction with Wabuno or South Channels. No master of a vessel should attempt to go through this passage for the first time by the directions alone, but should be guided by some one well acquainted with the channel.

The directions, however, will serve as a check upon the pilot, and the description of the principal dangers on the route enable a person to visit and buoy them, as should be done if traffic increases by this inside channel.

Caleb Island, before described, is the largest of a group of bare islets and rocks, the northern of which is dark with rough surface. Between this north one and a similar looking rock lying 300 yards north-northeast of it, there is a deep passage by keeping the north side of Edward Island in range with the corresponding extremity of the northern island of the Griffiths and Leonard Island Group bearing 87° (E. $\frac{1}{2}$ S.)

A patch with 12 feet water on it lies 300 yards eastward from the northern dark, rough rock of the Caleb Island Group, and the leading mark just given for the channel passes 150 yards northward of this patch.

William Island, 33 feet high, with a few trees on it, is situated 440 yards northeastward of the Caleb Island group. Two rocks awash lie near its southeast side from which shallow water extends to within 150 yards of the leading mark just given.

South Channel is the passage, with least depth of 10 feet in 1917, separating the southeast coast of Parry Island from the mainland. The track used is on the mainland side of McLaren and Isabella Islands, the shoalest places being Devil's Elbow, Seven Mile Narrows, Five Mile Narrows, and Two Mile Narrows.

A passage with a depth of 4 feet exists also on the Parry Island side via Indian Docks Channel and Menomine Channel, and, had nothing been done in the way of improvements to the track in use, it is a question whether the Parry Island Track would not have been the better to have been improved. There is good water for the whole length of the latter track excepting at the two localities above mentioned.

At the Indian Docks Channel, so called on account of the wharf-like appearance of its rocky shores, the length is nearly 880 yards with a depth of 4 feet. A portion of the bottom, here, is unmistakably solid rock, but boring in connection with a special survey would have to be undertaken to ascertain the exact proportions of dredging and excavation. At Menomine Channel, the reef with 4 feet water on it

connecting the southwest side of Isabella Island to Parry Island is only 10 yards wide and 38 yards long.

By South Channel, the distance from Lone Rock Light Buoy to Parry Sound Harbor is $17\frac{1}{2}$ miles; by Wabuno Channel the distance between the same points is $23\frac{1}{2}$ miles; the gain therefore by South Channel is 6 statute miles. The length of the inside channel from Starvation Bay to Turning Island, eastward of Frying Pan Island just briefly described, is 9 miles with a depth of 11 feet.

As it is concluded that no master of a vessel would attempt South Channel for the first time without some one on board possessing local knowledge, the usual detailed description of the features in this picturesque channel will be omitted.

Brief directions, will however, now be given, which with the track marked on the chart, assisted by the following 15 buoys, may assist somewhat in guiding a light-draft vessel through.

Buoys.—In 1913 there were nine red spar buoys on the starboard side of the South Channel in proceeding to Parry South Harbor, and six black spar buoys on the port side, namely, a red buoy southwest of Flossie Island; two red and one black in, and near Devils Elbow; two red and three black buoys in Seven Mile Narrows; one of each color in Five Mile Narrows near the northeast extreme of McLarens Island; three red and one black buoy in, and near Two Mile Narrows.

Beacons.—Two pairs of day beacons are erected on McLarens Island and the main shore to mark the line of best water through Devil's Elbow Channel.

Directions.—Having passed close westward of the white beacon on Turning Island so called from its being the turning point in this portion of the channel, and situated 440 yards northeast from McBrien Island steer 14° (N. by E. $\frac{1}{4}$ E.) for the bare south point of Shasha Island, distance $1\frac{1}{2}$ miles. When past Beauty Island haul to the northeast, pass eastward of a little rock 3 feet high, and northwest of the red spar buoy marking a rock awash lying 200 yards southwestward of Flossie Island.

Proceed through the narrow but good passage westward of the little Flossie Island, and eastward of Maud Island situated 1,320 yards northward from the latter. When 440 yards from McLarens Island, the vessel passes through a narrow channel, nearly in the middle of which is a rock with 4 feet water on it marked by a red spar buoy. The vessel should pass northwest of it and fairly close to the little island on the port hand, with 11 feet water (in low stages there may be 2 feet less).

The surveying steamer *Bayfield* in 1891, drawing 10 feet, proceeded by this track to within 300 yards of Devil's Elbow, anchoring in 5 fathoms in the little bay of the main shore.

Now follow the broken line shown on the chart through Devil's Elbow, Seven Mile, Five Mile and Two Mile Narrows, assisted by the buoys, to Parry Sound Harbor, being careful to signal three prolonged blasts of the steam whistle for the opening of Rose Point swing bridge before passing the northeast point of Isabella Island.

Moose Point (Moose Deer Point) is a projection of the mainland and the south entrance point of Moon River Bay, though the steamboat men apply the name to another point (composed really of a group of islands) situated $2\frac{1}{4}$ miles farther south, and between these two localities runs in a long narrow bay called Twelve Mile or Deep Bay, but up which the survey was not taken.

For description of shore southward of Parry Sound see chapter VII.



CHAPTER X.

LAKE HURON—NORTHERN SHORE—HUNGERFORD POINT TO DETOUR PASSAGE.

The low water of 1895 (579 feet above mean tide at New York) was 1 foot below the datum used in this chapter.

Plan.—The plan of this chapter is to begin with Hungerford Point and describe the southern shore of Manitoulin, Cockburn, and Drummond Islands from east to west.

Hungerford Point.—This most southern extremity of Manitoulin Island may be known by its small white stony beaches. Scattered stones and shallow water extend from this point 440 yards in a south-west direction, but the southeast side is steep-to.

Thomas Bay.—From Hungerford Point the shore trends in a general northwest by west direction 4.6 miles to the southeast entrance point of Thomas Bay. The low shore is indented by insignificant bays, and fringed with bowlders and very shallow water for a distance of 300 yards, the 3 fathoms curve extending 200 yards farther.

The shores of this large open indentation are clean outside the distance of 200 yards. The anchorage in and shelter from all but southerly winds is excellent, the best track in being close to the southwest entrance point. The mouth is 1 mile wide, and the bay runs $1\frac{1}{2}$ miles in a northeasterly direction.

Mayflower Island is a small, partially wooded island lying 1,175 yards southward from the southeast entrance point of Thomas Bay. A spit extends from it southwestward 590 yards.

Vigilant Rock, with 12 feet water over it, is the southerly termination of a spit from Manitoulin Island. It lies 1,320 yards off the shore 1 mile southeast from Mayflower Island.

Grantham Shoal, with 8 feet water on it, is small and lies southward 1,320 yards from the same.

Todman Reef.—The mouth of Thomas Bay is partially obstructed by reefs, the most important of which is Todman Reef with 7 feet water over its south end, distant over 1,320 yards from the southeast entrance point. The reef is narrow and 590 yards long in a northeast direction.

Two spots with 16 and 18 feet over them lie northwestward 300 and 500 yards, respectively, from Todman Reef. There is a channel

300 yards wide between Todman Reef and the shoal water from the southeast entrance point of Thomas Bay.

Clearing mark.—To pass southwest of Todman Reef, Grantham Shoal, and Vigilant Rock, keep Black Summit of Yeo Island in range with the west end of Perseverance Island bearing 135° (SE. $\frac{1}{2}$ S.).

Thomas Point, the northwest entrance point of Thomas Bay, has a spit with depths under 5 feet extending from it in a southerly direction over 590 yards.

South Bay (Manitoulin Gulf) is a large inlet on the south coast of Manitoulin Island, $8\frac{1}{2}$ miles from Hungerford Point, its southeastern extremity. It trends in a general northeast direction $15\frac{1}{2}$ miles from the entrance and has a maximum width of nearly 3 miles. South and on the north side of the island Manitowaning Bays are separated by less than 2 miles.

It is composed of two wider portions, or lakes, connected by narrows 1,175 yards wide situated 4 miles from the entrance. The southwestern lake widens out at 1 mile from the entrance, is nearly 3 miles long, and averages $1\frac{1}{4}$ miles in width. Outside a bank 300 yards wide along the shores, the water is from 5 to 7 fathoms deep over mud, forming an excellent anchorage.

The northeastern and larger portion has a length of 10 miles, its northwest shore being composed of several slight bays and unimportant points. The banks from the points are narrow, but broader in the bays, and that from the low swampy bottom of the bay under the depth of 3 fathoms is more than 1 mile broad. The southeast shore from the bottom to the mouth of Roberts Bay, and from Benson Point to the narrows is steep to. The middle of the bay has depths of 20 to 32 fathoms.

The northwest shore gradually rises, and, a little over 1 mile back is surmounted by a bare limestone cliff, in places 300 feet high. The southeast shore is surmounted by a high well wooded limestone cliff reaching for the most part to the shore.

McGaw Point, the southeast entrance point of South Bay, is $2\frac{1}{2}$ miles west-northwest from Thomas Point. About 1 mile southeastward of McGaw Point is a slight bay fronted by a very shallow bank 880 yards wide, but the rest of the shore may be approached 200 yards from McGaw Point itself, a rock with 8 feet water over it lies northwest 75 yards, and shoal water to the depth of 13 feet extends northwest by west 150 yards. The north and northeast sides of McGaw Point are steep to.

Buoy.—A red spar buoy usually marks the latter danger.

Depths in entrance.—The narrowest part of the channel is abreast of McGaw Point. Here the width between the 3-fathom curves is 75 yards and the depth 21 feet.

Range Lights—Front Light.—A fixed white light, 28 feet above water, visible 10 miles, is shown from a white, square, wooden structure, on the southeast end of a small limestone island lying on the north side of the mouth of South Bay.

Rear Light.—A fixed white light, 46 feet above water, visible 12 miles, is shown from a white, square, wooden structure, on Manitoulin Island, 257 yards 24° (NNE. & E.) from the front light.

Both lights are cut off by McGaw and Birch Points, the front one being visible through an arc of 94°, and the rear light through an arc of 79°. These lights in range lead through the narrows in a depth of 21 feet.

Reefs.—Of the dry reefs on the northwest side of the channel between the narrows and the village, the east side of the southwest reef is steep to; the others have shallow water extending southeastward 50 yards.

Buoy.—A black spar buoy, known as Turning Buoy, usually marks the edge of this bank, being moored 130 yards southeast of the front range light.

Wharf.—There is a small wharf for shipping fish, at which 10 feet water will be found.

South Baymouth is the village on the west side of the entrance and 440 yards northeastward from McGaw Point. It has a post office with mail twice a week from Manitowaning by stage. The population is about 100, mostly fishermen with their families.

A rock with 15 feet water on it lies 1 mile south-southwest from McGaw Point, and 400 yards southeast of the line of range lights, and is the only outlying danger off the entrance to South Bay.

Buoy.—A red spar buoy, known as Entrance Buoy, is usually moored off the west side of this rock.

Scotchie Reef is a low, dry rock lying close to the shore 1,175 yards westward of South Baymouth Village.

Inkster Rock, with 4 feet water on it, is the outer end of a spit from Scotchie Reef, off which it lies 590 yards southeastward. The two lights in range lead 175 yards, southeastward of this rock.

Buoy.—A black spar buoy usually marks this danger.

Benson Point, on the southeast shore of South Bay and 6½ miles from McGaw Point, forms the northwest entrance point of Roberts Bay. It has a small spit 100 yards wide extending from it.

Roberts Bay is a rectangular indentation 2 miles long and 880 yards wide. The shores are fairly clean, but a shallow sand bank extends 880 yards from the bottom. The distance between the bottoms of Roberts and Thomas Bays is a little under 1 mile.

Indian Village makes a conspicuous mark on the southeast shore 11½ miles from South Baymouth. The houses are built along the

beach for about 1 mile and are all whitewashed. A Roman Catholic church with spire is the most conspicuous of the buildings.

Glycerine Rock.—The only real danger in South Bay is off this village. It is a pile of boulders with about 3 feet water over them, lying 1,320 yards, 302° (NW. $\frac{1}{2}$ W.) from the church. It has 12 fathoms water close northwestward of it, and 10 fathoms between it and the shore.

Directions for entering South Bay.—When not less than 2 miles from the entrance, bring the South Baymouth Range lights in range 24° (NNE. $\frac{1}{2}$ E.) and steer for them so, passing northwest of two red, and southeast of two black spar buoys, until the southwest dry reef of the front range light group is nearly on the port beam. A vessel having now passed the narrows, with least depth of 21 feet, should haul sharply eastward steering about 73° (E. by N.), passing southeastward of Turning Buoy, and, proceeding on in mid-channel, a vessel may anchor off South Baymouth Wharf.

If proceeding into Lake Huron a vessel should keep the South Baymouth village shore on board, pass southeast of Turning buoy, and bring the range lights in range astern.

Caution.—Nearly always, except in heavy weather, there is a strong current running out of South Bay, and masters of vessels should watch very carefully as the turn of the channel is sharp and narrow. In daylight the buoys mark the dangerous spots; at night a stranger should not attempt it.

Birch Point is an inconspicuous point situated $1\frac{1}{4}$ miles westward from Scotchie Reef, the shore between taking the form of a slight bay fringed with shoal water for 300 yards.

Red Dan Rock, with less than 6 feet on its shoalest spot, lies a little over 440 yards southeastward of the nearest part of Birch Point. It is surrounded by shoal water for 200 yards.

Walker Point lies a little more than 1 mile westward from Birch Point, and between them are two unimportant points and three shallow bays, the whole fringed with shallow water for a width of 440 to 590 yards. Walker point is broken up into one conspicuous small island and a great many dry rocks. A very shallow spit makes off southwest 590 yards from Walker Point.

Volunteer Spit is the southerly termination, with 14 feet over it, of a reef extending southward 1,320 yards from the first small point eastward of Walker Point.

Genesta Bank, with less than 6 feet water over its shoalest part, is a large bank lying in the mouth of the bay, and midway between Michael and Walker Points. Inside Genesta Bank and the line joining it to Walker Point Spit it is not advisable for a vessel to go.

Maiden Island, oblong in shape, 300 yards long, northeast and southwest by 200 yards in width, lies $1\frac{1}{4}$ miles northwest of Walker

Point, and excepting the southeast side, the island is beset with shoal water. A rock awash on the bank surrounding Maiden Island, lies 440 yards southwest from the south point of the island.

Michael Point, $1\frac{1}{2}$ miles westward from Maiden Island, is a long, narrow point stretching almost from the head of Michael Bay in a general westerly direction $2\frac{1}{4}$ miles, to the outer rock. The outer 880 yards of the point is broken up into a rocky island (18 feet high and thickly wooded) and several dry rocks.

Between the island and the point is a narrow passage, though only 8 feet of water may be carried through it. From the outer dry rock a narrow spit makes out westward 1,175 yards to a depth of 11 feet. On this spit no less water will be found until close to the dry rocks, but on the contrary there are several deep passages through for those locally acquainted.

Advance Reef is a very dangerous obstruction, both to the navigation of Michael Bay and to vessels moving up and down the shore. Its shoalest part is awash and bears 265° (W.) $1\frac{1}{4}$ miles from the nearest Michael Point dry rock. This narrow reef extends west-southwest 440 yards to a depth of 14 feet, and in the opposite direction over 590 yards to a depth of 8 feet. Between the east end of Advance Reef and the spit from Michael Point is a passage 440 yards wide, but no range mark offers.

Two detached spots, with 11 and 14 feet over them, lie, respectively, west-northwestward 880 yards, and south-southwestward 590 yards from the spot awash. Between the end of Advance Reef and Buckeye Shoal is the passage into Michael Bay, $1\frac{1}{4}$ miles wide, while between it and Rathbun Point the entrance is nearly $1\frac{1}{4}$ miles wide. As no good marks offer for clearing Advance Reef, the master of a vessel must use caution while in its vicinity.

Michael Bay, inside the line joining Hammond Point to the outer dry rock off Michael Point, is $2\frac{1}{4}$ miles long east and west, with an almost uniform width of 1 mile. The south shore for 1,320 yards eastward of the mainland portion of Michael Point is clean and may be approached to within 100 yards. Hammond Point may be approached to within 200 yards for 590 yards southeast from the most southerly part of it, when the shoal bank widens out to a width of nearly 1 mile from the sand beach in the northeast corner of the bay, leaving a narrow lane of deep water between it and the shallow bank from the south shore. The shore of the bottom of Michael Bay for nearly $1\frac{1}{4}$ miles south of Manitou Creek is clean sand beach.

A rock with 11 feet water over it lies 1,320 yards northeast from Michael Point (mainland) and a little over 200 yards from the nearest point on the south shore. This and Chisholm Rock are the worst dangers in Michael Bay.

Blue Jay Creek is small and empties into the bay at a point 1,320 yards southeast from the wharf.

Manitou Creek empties into the bay 440 yards northeast of the wharf. Close to its mouth is a waterfall of about 10 feet, furnishing power to a small sawmill.

Village.—There is a small village at the mouth of Manitou Creek.

Wharf.—A small wharf, at which 7 feet water will be found, is situated on the north shore of Michael Bay $1\frac{1}{4}$ miles from Hammond Point.

A rock with 12 feet water over it lies 880 yards south-southwest from the wharf, leaving as much as 20 feet between them.

Chisholm Rock, with 5 feet water on it, is a dangerous spot on the north shore bank, 1,320 yards east-southeast from Hammond Point.

Clearing mark.—To pass southwest of Chisholm Rock keep Jenkins Point in sight southwest of Hammond Point, bearing 289° (NW. by W. $\frac{1}{4}$ W.).

Anchorage.—If the master of a vessel is desirous of loading off the mouth of Manitou Creek 15 feet can be carried to within 880 yards of it by heading for the middle of the bay, keeping Jenkins Point a little open southward of Hammond Point, 289° (NW. by W. $\frac{1}{4}$ W.), until the wharf bears 354° (N.), when haul up for it. The anchor may be dropped when the proper depth is reached. If a vessel desires only shelter she can drop anchor anywhere off the south shore, taking care to avoid the 11-foot rock before mentioned. Probably the best all-round anchorage is southeast of Chisholm Rock, with Rathbun Point in sight southwest of Hammond Point, in 21 feet over clay, and the wharf bearing 17° (NNE.). Anywhere outside the 3-fathom curve a vessel will find holding ground, sand over clay, but the shelter is not good from winds between southwest and northwest.

Hammond Point, $1\frac{1}{4}$ miles westward from the wharf, is the north entrance point of Michael Bay. The point is broad and rounding, composed of small projections. It is comparatively clean, the shoal water lying off only 200 yards.

Carter Bay is the gradually curving indentation, 1 mile broad at the mouth and a half a mile deep, lying between Hammond and Rathbun Points. Its shore is mostly sandy and shows up very conspicuously. The sandy bottom is shallow for a width of 590 yards.

Rathbun Point is situated $1\frac{1}{4}$ miles northwest of Hammond Point. A spit makes out from it in a southerly direction 440 yards, and a detached shoal with only 12 feet water on it, lies in the same direction, 880 yards from the point.

A rock with only 7 feet water over it, and a very dangerous obstruction in the entrance to Carter Bay, lies 880 yards westward of the most southerly part of Hammond Point.

Rathbun Bay is a shallow and foul indentation lying about midway between Rathbun and Jenkins Points. It runs in 880 yards from the line of the points.

A shoal with 15 feet least water on it lies off this bay and nearly 1 mile southeast of Jenkins Point.

Jenkins Point, the next projection northwest of Rathbun Point, and $4\frac{1}{2}$ miles southeast of Providence Point, is like the rest of the shore, low and wooded. Shoal water extends 590 yards in a southerly direction from it.

Buckeye Shoal, one of the worst dangers on the shore, is very small, with less than 6 feet water on it, and lies nearly 1 mile southward from Jenkins Point. Another small rock, with 13 feet water on it, lies 880 yards west-northwest from Buckeye Shoal.

Hughson Bay, the bottom of which lies 1 mile northward from Jenkins Point, has nearly straight shores fringed with shallow water for 590 yards.

Timber Bay.—From the bottom of Hughson Bay its northern shore trends westward 1 mile and then northward 1,320 yards to the bottom of an indentation called Timber Bay, the shore being low, stony, and covered with small spruce, tamarack, and birch. At a distance of 200 to 400 yards from the east shore of Timber Bay lie two islets, and westward of the northern islet are two dry rocks. Shoal water extends 440 yards west-southwest from the outer dry rock.

A rock with less than 6 feet water on it lies over 590 yards southward from the southern islet.

Timber Bay Shoal is a rock 2 feet above the water lying over 1,320 yards southwest from the southeast entrance point to Timber Bay. Shoal water extends from it southeastward 200 yards, otherwise the rock is clean.

Anchorage may be had in Timber Bay by bringing the outer and western dry rock to bear 175° (south), dropping the anchor when half way between it and the northern shore.

Providence Point is a rather bluff point, about 20 feet high, situated 305° (N. W. $\frac{3}{4}$ W.) $8\frac{1}{2}$ miles from Michael Point, or 3 miles west-northwestward from the bottom of Timber Bay, the intervening shore being fringed with shoal water for 880 yards, and forming the southeast entrance point to the bay of the same name. A shallow spit makes out from it in a southwest direction 440 yards, where will be found a depth of 14 feet. On the west side of the point, shoal water reaches out 350 yards, while a little farther north the bank is only 200 yards wide.

Light.—A fixed white light, 43 feet above water, visible 11 miles, is shown from a white octagonal wooden lantern on the end of Providence Point, Manitoulin Island.

Fog signal.—In thick weather a hand foghorn is sounded in reply to the whistles of steamers in the vicinity.

Everett Reefs are a group of dry rocks lying 590 yards from the shore midway between Timber Bay and Providence Point. Shoal water extends 440 yards southwest from them.

Providence Bay is the first indentation of any importance east of Duck Islands, the lighthouse being 31 miles eastward from Outer Duck Island and 35 miles northwest from Cove Island Lighthouse. The bay is open to southerly winds and sea, but a vessel with good ground tackle could ride out a moderate gale by first anchoring under the southeast shore, and when the wind changes to southwest, moving to a berth under Simcoe Point. The bottom is sand over clay.

From Providence Point the shore of the bay trends northeastward 1 mile and northwestward the same distance, forming the bottom consisting of a sand beach. The 1,320 yards of shore northeast from Simcoe Point is lined with large boulders. The shallow bank from the southeast side has a width of 200 to 400 yards; from the beach and the northwest sides the bank is 590 yards wide. The anchorage water has a depth of 2 to 4 fathoms.

Wharves.—A wharf has been built by the Government out to 14 feet water, about 880 yards northeast of Providence Point. Another is situated near the village about the middle of the sand beach and at the mouth of a small stream, but has only 6 feet of water at its outer end.

A boulder with only 9 feet water on it lies north-northwest 200 yards from the Government Wharf.

Providence Bay Village had in 1905 a population of about 200 and is situated near the middle of the sand beach. It is the center of a large farming and ranching district, and from it large herds of cattle are shipped to Saugeen Peninsula. The village is connected by telephone with the other villages on Manitoulin Island and with the telegraph system at Little Current. Only very limited supplies can be obtained.

To enter the bay, bring the village wharf to bear 40° (NE.) and proceed thus, anchoring as convenient in about 4 fathoms or proceed to the Government wharf.

Simcoe Point is the northwest entrance point to Providence Bay and has deep water within 400 yards.

Simcoe Bank is an awkward obstruction in the entrance to Providence Bay. It has a least depth of 12 feet on its outer end, and is 1,320 yards southwestward of the east end of Simcoe Point. From

this position, the southeast edge of the shoal water trends northeastward $1\frac{1}{4}$ miles, joining the shoal water at the bottom of the bay.

Mutchmore Point.—From Simcoe Point the nearly straight shore trends west-northwest $1\frac{1}{4}$ miles to Mutchmore Point, the shore between being lined with bowlders and shallow water for 590 yards.

Dean Bay, of which Mutchmore Point is its southeast entrance point, is an unimportant bay with shallow water extending 880 yards from it.

Dean Spit, with 13 feet near its outer end, extends 880 yards southwest from the point between Dean and Lonely Bays.

Milton Point is a stony projection situated $2\frac{1}{4}$ miles northwest from Mutchmore Point.

Lonely Bay is a small shallow bay 1 mile eastward of Milton Point, the shore between being nearly straight and fringed with a shallow bank 300 yards wide. A small stream empties into this bay through a sand beach.

Milton Reef runs out from Milton Point 1,320 yards in a southwest direction to a depth of 16 feet, but in the same direction 880 yards from the point is a spot with only 6 feet over it.

Lougheed Bay is the shallow bay a little over 590 yards deep between Milton and Lougheed Points.

Lougheed Point is the rounding southeast entrance point of Square Bay, and separates it from Lougheed Bay; a spit with a depth of 12 feet extends nearly 880 yards from the east side of the point.

Lougheed Reef, with 13 feet on it, extends 1,320 yards southwest from Lougheed Point.

Square Bay is situated immediately northwest of Lougheed Point and is 880 yards deep, the shallow water extending nearly to the line of the containing points. Good holding ground may be had in patches between the bowlders in the mouth of the bay by approaching from the southwest to avoid Lougheed Reef.

Dominion Point is situated 3 miles westward from Lougheed Point. Two outlying shallow spots with 18 and 16 feet over them, lie over 1,320 yards southwestward and $1\frac{1}{4}$ miles west-southwest, respectively, from the eastern extremity of Dominion Point.

Dominion Bay, protected on the west by Dominion Point, is 1 mile wide across the mouth, and $\frac{1}{2}$ mile deep. There is good holding ground in patches in the mouth of the bay and shelter from westerly winds by anchoring about 300 yards from the east side of Dominion Point, where the shallow bank is only about 150 yards wide. The bank from the bottom of the bay is 590 yards wide, and from the southeast entrance point a spit extends southwestward 880 yards to a depth of 12 feet.

Melville Point.—From Dominion Point the low limestone shore trends straight west-northwest 3 miles to Melville Point, and is

fringed with shoal water for an average of over 590 yards. Melville Point, slightly rounding, is rather higher than the rest of the shore and composed of large broken stones.

Sprigley Bay is a roadstead marked by a small sawmill and stream that empties itself through a sandbank about $1\frac{1}{4}$ miles north of Melville point. Fairly good shelter may be had from southeast winds about 590 yards off the mouth of the stream, the holding ground of the anchorage being sand and clay.

The northwest entrance point of Sprigley Bay, $1\frac{1}{4}$ miles' north-westward from Melville Point, has deep water reaching to within 150 yards of it.

Portage Point is situated 4 miles northwest from Melville Point, the shore between being indented by Sprigley Bay already mentioned, and Portage Bay. From Portage Point shoal water extends 400 yards.

Portage Bay affords neither shelter nor holding ground, and the shores are very foul for 590 yards. The portage across to Lake Wolsey on the north coast of Manitoulin Island, is here, only 2 miles.

The southeast point of Portage Bay is nearly midway between Melville and Portage Points. Abreast of it, the shallow shore bank is only 300 yards wide, and continues with the same width to Sprigley Bay.

Thistle Reef is a long, narrow danger extending southward from the middle of Portage Bay. Its south end, with 11 feet near it, lies 2 miles south-southeast from Portage Point. The reef is $1\frac{1}{4}$ miles in length, and the shoalest spot with depth of 6 feet is on the northern end, nearly $1\frac{1}{4}$ miles southeast from Portage Point.

Gatacre Point.—From Portage Point the shore trends westward 4 miles to Gatacre Point. The eastern half is straight and fringed with outlying boulders and very shallow water to an extent of 590 to 880 yards. The shallow bank from the western portion has an average width of 300 yards. From Gatacre Point itself, a shallow bank extends in places 590 yards.

Shamrock Bank has less than 6 feet water on it and lies $1\frac{1}{4}$ miles east-southeast from Gatacre Point, and 1,175 yards from the nearest land. The bank extends 440 yards outside this shoalest spot.

Murphy Point is a narrow peninsula separating Murphy Harbor from Frechette Bay. Shoal water lies off the point 590 yards.

Murphy Harbor is a shallow boat harbor running in 880 yards from the eastern extremity of Murphy Point. From Gatacre Point the shore trends $2\frac{1}{4}$ miles northwest to the southeast entrance point of the harbor, 1,175 yards east-southeast from Murphy Point. A small islet lies in the middle of the mouth, and shelters the harbor. The deepest water, 7 feet in the entrance, is about midway between the islet and the southeast entrance point; and only about 10 feet can

be had inside. The north shore of the harbor is shallow for a space of 300 yards. The best anchorage is between the islet and the north-west corner of the bay and about 300 yards therefrom.

Frechette Bay is very shallow, $1\frac{1}{4}$ miles long, and from 200 to 600 yards wide, running in just eastward of Frechette Point. The whole shore is very low and shelving and has shallow water off it for 800 yards.

Frechette Bank, with less than 6 feet water on it, is the outer end of the reef, which extends nearly 1 mile southward from Frechette Point. Two shallow spots, with 15 to 17 feet water over them, lie nearly 880 yards south and southwest, respectively, from Frechette Bank.

Taylor Reef is a long, narrow, disjointed reef lying in the approach to Misery Bay. Its south end, with 16 feet water on it, lies $1\frac{1}{4}$ miles southward from the west entrance point of Misery Bay. From this south end the reef trends nearly straight to the shore bank extending across the entrance to the bay. The shoalest spot on the reef has 13 feet over it and lies a little over 1 mile from the west entrance point. In entering the bay, strangers should pass eastward of Taylor Reef, but those well acquainted cross the reef in several places.

Saunders Reef is a very shallow circular bank 440 yards in diameter lying 1 mile southeastward from the west entrance point to Misery Bay, and midway between Taylor Reef and the shore southeast of the entrance. The channel of approach to the bay leads between these two reefs.

Misery Point, nearly 3 miles westward from Frechette Point and 1,320 yards in the same direction from the west entrance point of Misery Bay, has shoal water extending from it in a southerly direction 590 yards, and southeastward 300 yards. Thence, to the bank across the entrance to Misery Bay the shallow bank is 590 yards wide.

Misery Bay.—From Frechette Point the gradually rounding shore trends in a general northwest direction, 2 miles to the entrance of Misery Bay. The whole shore is very low and shelving and the southeast portion has shallow water extending from it 880 yards. The bay is $1\frac{1}{4}$ miles deep, and has a nearly uniform width of 590 yards. The bay is suitable for only a couple of small vessels, as only 13 feet water can be had, and that at 880 yards inside the entrance. The width of the harbor will not allow of a vessel swinging with a long scope of cable. The 3-fathom curve is 590 yards from the entrance of the bay. To enter, open the bay when not less than $2\frac{1}{2}$ miles, and proceed in with the middle of the entrance bearing 338° (N. by W. $\frac{1}{4}$ W.). After shutting in Misery Point, anchor in the middle in 13 feet over sand and mud.

Methuen Rock is the very shallow end of a flat trending 1,320 yards southwestward of Misery Point.

Clearing mark.—Murphy Point just in sight southward of Frechette Point 80° (E. $\frac{1}{2}$ N.), leads southward of Methuen Rock and to the entrance of Misery Bay with not less than 17 feet.

Goose Point is situated $3\frac{1}{4}$ miles west-northwest from Misery Point, and, like nearly all the south coast of Manitoulin Island, is low, rocky, and lined with bowlders. Shallow water makes off from it 440 yards west-southwest and 1,175 yards south-southeast.

Hensley Bay.—From Misery Point the shore, which may be approached to 300 yards, trends northwest $2\frac{1}{4}$ miles to the bottom of Hensley Bay, which consists of a sand beach 590 yards long with a flat extending from it nearly that distance.

Buller Reef is a small cluster of dry stones lying 440 yards southeast from the broken up west entrance point of Hensley Bay. Deep water approaches to within 200 yards of the east side, but a spit makes out 1,175 yards in a southerly direction from the reef to a depth of 16 feet. A couple of detached spots with 17 and 18 feet over them lie on the same bearing distant, respectively, a little under and a little over 1 mile from the reef.

In addition to these shoals the whole shore between Hensley Bay and Goose Point has a shallow bank extending from it 1,175 yards.

Walkhouse Point, a very dark-tinted, low, narrow point, is situated $2\frac{1}{4}$ miles westward from Goose Point and has shoal water extending off it 400 yards. It forms the west entrance point to the bay next described.

Carroll Wood Bay is a very large, triangular-shaped indentation, and from the line joining Walkhouse and Goose Points is $1\frac{1}{4}$ miles deep. The east shore is shallow for about 300 yards; the bottom can not be approached nearer than $1\frac{1}{4}$ miles, and the middle part of its western shore has a shallow bank extending from it 880 yards. The deep water, from 5 to 6 fathoms, is spoiled by the three banks next mentioned.

Morrell Reef, with only 6 feet of water near its middle, is a narrow shoal 1,320 yards long north and south, and its shoalest spot is situated 1,320 yards westward from Goose Point. Between it and Seaman Reef is a lane 5 to 6 fathoms deep and 880 yards wide, while the passage between its south end and the bank from Goose Point is almost blocked by a shoal with only 12 feet water over it.

Seaman Reef lies with its shoalest spot of 11 feet, in the middle, $1\frac{1}{4}$ miles east-northeast from Walkhouse Point. It is narrow, and 590 yards long north and south.

Gaspesia Shoal is a narrow strip with 17 feet water upon it, 590 yards long north and south, situated 880 yards east-southeast from Walkhouse Point.

Queen Point, the next northwestward from Walkhouse Point, and 590 yards therefrom, has shoal water extending from it 440 yards on all sides.

Walkhouse Bay is a shallow indentation lying between Walkhouse and Queen Points. It has a depth of only 8 feet at its entrance, with 10 to 19 feet inside over a limited area.

Fisher Bay is a very shallow bight on the northwest side of Queen Point, the entrance being 880 yards and the bottom nearly 1 mile northward of this point.

Budyard Reef is a small dry spot 880 yards westward from Queen Point and 440 yards from the shore. From it shoal water extends 880 yards in a southerly direction.

Green Point, so called by reason of the light color of the birches growing on the point in contrast with the dark spruce and pines, is situated west-northwest $1\frac{1}{2}$ miles from Queen Point and there is no navigation inside the line of the points. Green Point is almost joined to Inner Duck Island, 2 miles south-southwest, by a shallow sand and boulder bar; but good water approaches the south side of Green Point to within 440 yards.

Thibault Shoal is the shoalest spot on this bar, and has over it less than 6 feet. It is 590 yards long north and south, very narrow, and is situated nearly midway between the point and island. The bar may be crossed between Thibault Shoal and Green Point in 16 feet, by bringing Girouard Point in range with the south end of Burnt Island bearing 299° (NW. by W.)

Duck Islands, usually called the Ducks, are a group of five islands lying west-northwest 63 miles from Cone Island Lighthouse and east-southeast 51 miles from Point Detour Lighthouse, also from 2 to 12 miles south of Manitoulin Island, and 13 to 22 miles from its west end. Excepting Great Duck Island, none are high but for the trees which grow thickly on them.

Inner Duck Island has the shape of an irregular quadrilateral, being nearly 1 mile long north and south by 880 yards in greatest width. It is composed of large bowlders, is about 10 feet high, and thickly wooded with small timber. The north end is, however, a gravel bank upon which are a few fishermen's huts. Landing on the east side is very bad. Shoal water makes out 880 yards from the south point, but the west side may be approached to 200 yards, and the east side 440 yards.

Macauley Spit is the southern termination of a shallow spur that makes out in a southerly direction over 1,320 yards from the most easterly point of the island.

Middle Duck Island is very similar to the last mentioned island in appearance and size, but is the smallest of the group. It lies 3

miles from Inner Duck Island, has a length north and south of over 1,320 yards, and a maximum width of 440 yards near its middle.

A spit with 7 feet at its outer end extends 1,175 yards northward from the north end of Middle Duck Island. The east side may be approached to within 200 yards. The southeast point has a spit with 8 feet near its outer end extending from it south-southeast 440 yards. The south side and the northern half of the west side should receive a berth of 440 yards.

Kipling Reef is a very shallow bank lying 880 yards westward from the southern portion of Middle Duck Island, and between them is no passage. From this reef shallow water extends still farther north-northwest nearly 590 yards to a depth of 14 feet.

Clearing mark.—To pass west of this reef keep the gap between Great and Outer Duck Islands closed, bearing 168° (S. $\frac{1}{2}$ E.). Not more than 6 fathoms can be carried between Middle Duck and the two islands south of it.

Great Duck Island is the largest of the group, and, with its height (about 200 feet) and heavy timber, makes a conspicuous object for a long distance. It is $4\frac{1}{2}$ miles long, north and south, with a maximum width of $2\frac{1}{2}$ miles near its middle. The coast line is low and fringed with bowlders, making landing anything but comfortable, while inland there is some fine farming land and heavy hardwood timber.

Light.—A group flashing white light, 89 feet above water, visible 18 miles, is shown from a white, octagonal, pyramidal, concrete tower, on the southwest point of Great Duck Island.

Fog signal.—The fog signal is made on an air diaphone.

The coast between the lighthouse and the northwest point, 3.3 miles, is clean and may be approached to 200 yards at the north end, and 100 yards near the lighthouse.

Desert Point, the northeastern extremity of Great Duck Island, is rendered conspicuous by its bare sand hills and lies nearly $1\frac{1}{2}$ miles southwest of the southwest point of Middle Duck Island. Very shoal water fringes Desert Point for 200 yards, and the 3-fathom curve rounds the point at 440 yards.

From Desert Point the north coast runs nearly straight westward, almost $1\frac{1}{2}$ miles to the northwest point of the island, and has very shoal water extending from it 200 to 300 yards.

Manitoba Reef, 3 feet above water and small, lies 1,175 yards northeast from the northwest point of Great Duck Island. It has deep water close to its north side, but there is no passage between it and the island. Shoal water extends 590 yards westward from it.

Horseshoe Bay is a shallow, nearly circular bay, 880 yards in diameter, on the west side of Great Duck Island, nearly 2 miles northward of the lighthouse. Only 7 feet can be carried in, and, as the

bottom is strewn with large bowlders, it is not recommended for anything but boats.

From the lighthouse the coast runs southeast, $1\frac{1}{4}$ miles, nearly straight to the south point of the island. It is fringed with bowlders and indented by several small coves, one of which near the lighthouse affords fair landing. From the middle of this coast shoal water extends 880 yards.

A spit with 17 feet of water at its south end, runs out southwestward nearly 1,320 yards from the south point. Shallow water extends south 590 yards and east 440 yards from the same point.

Mary Shoal, small, with least water of 9 feet at its south end, lies a little over 880 yards south-southeast from the south point of Great Duck Island. The shoal is elliptical in shape, 440 yards long northeast and southwest, and 250 yards wide.

Kitty Shoal, with 11 feet least water near its middle, is 880 yards long, northeast and southwest, and 200 yards wide. The middle of the shoal lies southward, and is a little over 1 mile from the south point of Great Duck Island.

Clearing mark.—Walkhouse Point, on Manitoulin Island, in range with the wharf on the northwestern extremity of Outer Duck Island, bearing 18° (NNE.), leads southeast of Kitty and northwest of Mary Shoal.

Larry Rock, with 14 feet water on it, lies close westward from Kitty Shoal.

A small rock, with 19 feet least water on it, lies $1\frac{1}{2}$ miles south from the lighthouse.

Clearing mark.—To pass west of the above shoals, at least one-third of Western Duck Island must be visible west of Great Duck Island.

Jennie Graham Shoal is the most southerly and therefore the most dangerous of the reefs lying southward of Duck Islands. There are several bowlders on the shoal with only 8 feet of water over them; the most southerly is 1.8 miles from the south point of Great Duck Island and nearly $2\frac{3}{4}$ miles 155° (S. by E. $\frac{1}{2}$ E.) from the lighthouse.

Bell buoy.—The southern end of Jennie Graham Shoal is marked by a steel buoy painted red, and surmounted by a bell rung by the action of the waves. The buoy is moored in 7 fathoms water bearing 158° (S. by E. $\frac{1}{2}$ E.), distant nearly $3\frac{1}{4}$ miles from Great Duck Island Lighthouse.

Clearing marks.—To pass east of this shoal keep the west side of Middle Duck Island open east of, or touching the east side (Gravel Point) of Great Duck Island, bearing 4° (N. $\frac{1}{4}$ E.).

To pass west, keep Walkhouse Point touching the northwest point (wharf) of Outer Duck Island, bearing 18° (NNE.). This mark

will lead a vessel close up to the wharf with not less than 15 feet water.

Ascertaining distance.—If the master of a vessel has a sextant he can ascertain his distance south of the islands and the shoals as follows: If from the southeast on the course from Cove Island Light-house; as Middle Duck Island is disappearing behind Outer Duck Island, measure the angle subtended by Great and Outer Duck Islands together. If it be greater than 28° , the vessel will pass less than 1 mile from Jennie Graham Shoal; if less than 28° , the vessel will pass further out.

If from the northwest, on the course from Detour Passage; as the gap between Great and Western Duck Islands is closing, measure the angle subtended by Great and Outer Ducks. If it is found to be greater than 57° , a vessel will be rather close in.

Note.—The direct line from Detour Passage to Cove Island passes through Great Duck Island, so that a vessel will not save much by passing between Great and Middle Duck Islands, but would sacrifice the safer track south of the group.

Gravel Point, on the east side of Great Duck Island, is situated $1\frac{1}{2}$ miles north-northeast from the south point of the island, the coast between being nearly straight, the southern half lined with bowlders and the northern half forming a slight bay with good landing for boats.

Wharf.—In the above-mentioned bay is a small fishing establishment with a pile wharf attached thereto, at which 12 feet of water will be found.

The slightly rounding point 1,320 yards south of Gravel Point is connected to Outer Duck Island by a sand bar over which not more than 15 feet can be carried. The bar is 440 yards wide and may be crossed by steering 18° (NNE.) with Falkhouse Point in range with the wharf on Outer Duck Island.

Anchorage in 7 to 10 fathoms may be had just north of the bar, with the whole of Middle Duck Island in sight west of the wharf on Outer Duck Island, and about 440 yards southward of the latter; or a vessel may pass north of the narrows and anchor on the flat extending from the east shore of Great Duck Island, but the former anchorage gives the better shelter.

Bain Rock is a dangerous rock, just covered, lying on the sand bar. It lies 440 yards from the middle of the west side of Outer Duck Island and nearly 1 mile southward of the Outer Duck Island wharf.

From Gravel Point the east coast of Great Duck Island trends northward 2 miles nearly straight to Desert Point. The shore is fringed with bowlders except for a small piece of beach near Gravel Point and shallow water fronts it for an average of 590 yards.

Outer Duck Island is the most southerly of the group. It is 23 feet high near its north end, which is cleared and covered with the huts of fishermen who do an extensive business here.

The island is situated eastward and abreast of the southern half of Great Duck Island. It is 2 miles long north and south and under 880 yards in greatest width at the middle. The wharf near the northwest point of the island is almost abreast and 590 yards from Gravel Point, the nearest part of Great Duck Island. The navigable channel opposite the wharf, though only 200 yards wide, is 10 fathoms deep.

A spit makes out northward 590 yards from the north point of Outer Duck Island to a depth of 12 feet.

The whole of the east coast of Outer Duck Island is fringed by large bowlders just covered for a width of 200 yards and shallow water for another 200 yards.

A narrow spit extends over 1 mile southward from the south point of Outer Duck Island to a depth of 14 feet, with very shallow water on the northern half. There is a channel of deep water 1,320 yards wide between this spit and the shoals south of Great Duck Island, and it may be navigated to within 1 mile of the wharf on Outer Duck Island by bringing any part of Middle Duck Island in range with the same wharf. But, to pass over the bar, as before mentioned, the vessel must bring Walkhouse Point touching the wharf bearing 18° (N. NE.). Except opposite Bain Rock, the west coast of Outer Duck Island may be approached to 200 yards.

Anchorage.—Eastward from Great Duck Island, between Outer and Middle Duck Islands, is a flat $1\frac{1}{2}$ miles long north and south by 1,175 yards in width, with very even depths between 3 and 10 fathoms over sand and clay. On this flat vessels will find good holding ground and some shelter from westerly and northwesterly winds, but a heavy swell rolls in.

Western Duck Island is the largest but one, and, as its name implies, is the westernmost of the group. It has the shape of an irregular quadrilateral, is about 25 feet high, covered with trees and fringed with bowlders, except at its northeast point, which is a sand flat.

This point is 3 miles in a south-southwest direction from the south end of Burnt Island and $2\frac{1}{4}$ miles westward from Inner Duck Island. From this same point it has a maximum length of nearly 2 miles in a southwest direction and width of $1\frac{1}{2}$ miles.

From this northeast sandy point shallow water makes out in all directions 880 yards, and the north coast of the island trending westward over 1 mile is fronted by very shallow water for an average width of 590 yards. The coast then gradually sweeps around for

nearly $1\frac{1}{2}$ miles to the southwest point, being fringed with shoal water for a width of 440 yards.

Blake Point.—From the northeast point of the island the east coast trends southward $1\frac{1}{2}$ miles to Blake Point, and is fringed with outlying bowlders and shoal water for an average of 590 yards. Blake Point itself is a mass of bowlders off which shoal water extends southward nearly 880 yards. The point has deeply indented bays upon each side of it, but too foul to be useful.

From Blake Point the south side trends westward nearly 1 mile to the southwest point of Western Duck Island, and has a shallow bank extending from it 440 yards.

Shoals.—A small rock with 18 feet least water on it lies 1,320 yards northward from the northeast point of Western Duck Island. Two rocks with 11 and 12 feet on them lie 1 mile 330° (NNW. $\frac{1}{4}$ W.) and 319° (NW. $\frac{3}{4}$ N.), respectively, from the same point. A small rock with 17 feet least water on it lies north-northeast over 590 yards from the north point of the island.

A bank with 13 feet least water upon its western and shoaler end is situated with this end over 590 yards northwest from this same point. Thence the bank trends 590 yards eastward to a depth of 16 feet and is 200 yards wide, leaving a channel the same width between it and the bank from the island.

Western Duck Reef.—This important reef of bowlders is 1,175 yards long in an east-northeast direction and 590 yards wide near its west end. The shoalest spot of 8 feet is very near the middle and lies $1\frac{1}{2}$ miles northwest from the north point of Western Duck Island. There is a depth of 13 feet at the east end of Western Duck Reef.

A detached spot with 16 feet least water upon it lies 300 yards eastward of the east end of the reef.

Clearing marks.—To pass south of Western Duck Reef and its attendant shoals, keep the south end of Inner Duck Island shut in behind the northeast point of Western Duck Island, bearing 104° (ESE. $\frac{3}{4}$ E.), and to pass west of them keep the highest part of the trees on the northwest point of Great Duck Island open of the southwest side of Western Duck Island, bearing 155° (S. by E. $\frac{3}{4}$ E.).

Stafford Rock is a small, nearly circular shoal with 8 feet least water upon it, lying $1\frac{1}{2}$ miles westward of the south end of Burnt Island. Nearly in the same direction from Burnt Island, but 1.6 miles therefrom, is another small bank with 19 feet least water on it.

Clearing marks.—The west side of Great Duck Island touching the northeast point of Western Duck Island, bearing 180° (S. $\frac{3}{4}$ W.) will lead westward of Stafford Rock, but eastward of the 19-foot rock. Ivan Point in range with the south end of Burnt Island, bearing 88° (E. $\frac{1}{4}$ S.) will lead north of both.

Ivan Point is a narrow point situated nearly 1 mile northwest from Green Point, the bay between being over 590 yards deep between the line of the points and very foul. It is steep-to on its west side, but shallow water makes out from the point southwest 300 yards. The southern half of the bay between Ivan and Edna Points is clean and deep, but the northern half is very foul.

Edna Point forms the east shore of Christina Bay and has shoal water extending 300 yards south from it.

Christina Bay is a shallow bay on the east side of Burnt Island and almost joined to Burnt Island Harbor.

Burnt Island is situated with its south end $1\frac{1}{2}$ miles west-northwest from Green Point, and is steep-to on its southeast, south, west, and north sides. The island is practically now only a point, as not even a boat can pass between it and Manitoulin Island. It has the shape of an irregular quadrilateral, with a low limestone cliff on its west and north sides, and is $1\frac{1}{2}$ miles long in a northeast direction, by 1,320 yards in greatest width. It is chiefly important on account of the small fishing establishment and wharf on its north side.

Burnt Island Harbor is a large bay north of the island, in which will be found excellent anchorage in 3 to 6 fathoms over mud, sheltered from all winds. The entrance is clean, 1,175 yards wide in a northwest direction from the northwest point of the island, and from this line the bay is over 1,320 yards deep, and $1\frac{1}{2}$ miles wide at the bottom. The northwest corner can not be approached within 880 yards, nor the northeast within 300 yards; south shore is clean.

Off the most southerly part of the gradually rounding point separating Burnt Island and Rickley Harbors, a very shallow reef extends south 440 yards, and must be carefully guarded against in approaching and leaving Burnt Island Harbor.

Rickley Harbor is a foul bay fit only for boats 1 mile westward from Burnt Island Harbor. Across the mouth it is 880 yards wide by 590 yards deep.

Girouard Point is a low, bluff, sharp point, projecting westward, with good water off its end and south side, and situated $1\frac{1}{2}$ miles northwest from the northwest entrance point of Rickley Harbor. Off the middle of this stretch a very shallow spit runs out 590 yards.

Ainslie Rock, with less than 6 feet of water upon its north end, has this spot lying over 590 yards southward from Girouard Point. The bank is elliptical in shape, a little over 590 yards long north and south, and 440 yards wide, and has only 13 feet of water near the south end.

Clearing mark.—To pass south of this shoal keep Green Point in sight south of Burnt Island bearing 107° (ESE. $\frac{1}{2}$ E.).

Belanger Point lies $2\frac{1}{2}$ miles westward from Girouard Point, and between them the water is deep. A shallow bay 1,320 yards wide

in the mouth, runs in $1\frac{1}{4}$ miles northeast of Girouard Point. Belanger Point has shoal water extending from its south end 440 yards, while on its east side the deep water comes close in.

Belanger Bay is an indentation running in just eastward of Belanger Point, nearly 1 mile wide across the mouth, and 1,320 yards deep to the northwest corner. In it the water is good to within 300 yards of the shores.

Labrador Reef is the southern termination of a bank extending a little more than 880 yards southward from Dunn Island to a depth of 11 feet, with 8 feet 300 yards north from it. The reef also extends 590 yards northwestward from this 11 foot spot, to a depth of 16 feet.

Jones Reef, with 10 feet least water on it, is a pear-shaped shoal with the stalk at the northeast end. The shoalest part is near the middle and lies 1 mile southward from Dunn Island. From this spot the shoal extends west, 440 yards to 18 feet, and northward a little more than that distance to the same depth.

Clearing marks.—To lead southwest of Jones Reef, keep the northeast point of Steevens Island touching the east end of Greene Island (tree) 319° (NW. $\frac{1}{4}$ N.).

To lead south of the reef, bring the north bluff of trees on Green Point in range with the south end of Burnt Island 97° (E. by S.).

Dunn Island, about 5 feet high, 440 yards long north and south, and about 200 yards in greatest width, is crescent shaped with bay on its west side, and is situated 1,175 yards westward from Belanger Point, the bight between them being foul and fringed with shoal water for 440 yards outside the line of the points.

Pearson Island, about 5 feet high, but covered with small trees, is a small island lying close northward of Dunn Island.

Quarry Point is situated over 590 yards northwest of Pearson Island, the shallow bay between them running in a little more than that distance. Quarry Point is also the southeast entrance point of Greene Island Harbor. The point has shoal water extending from it 440 yards southwest, and 880 yards westnorthwest.

Greene Island is large and conspicuous, lying as it does from 1 mile to $1\frac{1}{4}$ miles off the coast of Manitoulin Island. Its most westerly point is $2\frac{1}{4}$ miles southeastward from Lynn Point, and from this point the island extends eastward $1\frac{1}{4}$ miles with a maximum width of 1 mile. The island is rocky and is probably not more than 10 feet high, but is covered with a thick growth of light spruce and pine. Near the middle of the south side an excellent boat cove runs in 590 yards, while the eastern half of the north side forms the south shore of the harbor. The west and south sides may be approached to 300 yards; the northwest and southeast sides to 880 yards, while the east point and northeast side may be kept close on board.

Steevens Island is a small, low, well-wooded island 880 yards long north and south, by 300 yards wide, lying 440 yards from the middle of the north side of Greene Island. Only boats can pass between Steevens and Greene Islands, and a bar over which not more than 10 feet may be carried connects it in a northwesterly direction with Manitoulin Island.

Mink Reef, with less than 6 feet on it, is situated upon the latter bar, and lies 880 yards westward from the north end of Steevens Island.

Greene Island Harbor.—This excellent harbor, nearly $1\frac{1}{2}$ miles square, is situated northeastward of Greene and Steevens Islands. Steevens Island has good water on its east and north sides and the north shore of the harbor may be approached to 590 yards. The entrance is between Greene Island and Quarry Point, and is 1 mile wide with 5 to 8 fathoms of water. In the harbor itself any depth from 3 to 8 fathoms may be had, the best berth from wind and sea being probably close off the north side of Greene Island. The northeast side of Greene Island Harbor trends from Quarry Point north-northwest $1\frac{1}{2}$ miles to an old quarry and wharf, and thence westward a little over 2 miles to a broken up point, whence a rocky bar extends to Steevens Island as before stated.

Lynn Point is situated $2\frac{1}{4}$ miles from the broken-up point just mentioned, and $2\frac{1}{4}$ miles east-southeastward from the southwest point of Manitoulin Island. It is long, low, and narrow, and off it shoal water extends in a south-southwest direction 590 yards.

Purvis Reef, awash, lies nearly 1 miles east-southeast from Lynn Point. From the reef to a depth of 10 feet, the shoal extends over 440 yards in a southwest direction.

Carter Rock, awash, lies nearly 2 miles 139° (SE. $\frac{1}{4}$ S.) from the southwest point of Manitoulin Island. The bank is nearly triangular, the part awash being at the north end, and from it the bank extends southeast 300 yards to 16 feet, and southwest 590 yards to a depth of 18 feet.

Clearing mark.—To pass southwest of Carter Rock keep Mississagi Strait light in sight clear of the trees south of it, bearing 347° (N. $\frac{1}{4}$ W.).

Mississagi Strait is the water 5.6 miles long by $1\frac{1}{4}$ miles in least width (opposite Cinder Point), separating Cockburn Island on the west from Manitoulin Island on the east. With the exception of Magnetic Reefs and Castilian Shoal, the shores and approaches, both north and south, are clean.

Light.—A fixed white light, 46 feet above water, visible 13 miles, is shown from a white, square, wooden structure, on the west side of Manitoulin Island about 1 mile north of the southwest point, eastern side of Mississagi Strait.

Fog signal.—The fog signal is made on an air diaphone.

Wharf.—In the small cove, and about 80 yards northeast of the lighthouse, is a wharf 50 feet square, at which the lighthouse tender Simcoe, drawing $13\frac{1}{2}$ feet, lay alongside in 1914, with her bow touching the low cliffy shore. Inside the wharf is a boathouse.

Telephone cable.—Crossing Mississagi Strait from the Lighthouse to Cockburn Island between Cinder Point and Rickett Harbor, is a telephone cable by which connection can be had between Cockburn Island village and the telegraph system at Little Current.

The low rocky coast of Manitoulin Island from Lynn Point to its southwestern extremity, is indented by a couple of foul bights, and shoal water extends nearly 1,175 yards from the shore. From the southwest point of the island itself, a shoal bank extends southward 590 yards, and, thence, the coast trends northward nearly straight, $1\frac{1}{2}$ miles to the lighthouse, and is fringed with shoal water for 300 yards.

Meldrum Point.—The west coast of Manitoulin Island from the lighthouse to Meldrum Point is gradually rounding and very steep-to excepting the $1\frac{1}{2}$ miles southwest of Meldrum Point, whence a fringe of shoal water extends 150 yards. Meldrum Point is backed by a tree-covered ridge about 200 feet high. (Northern shore of Manitoulin Island described later.)

Cockburn Island, belonging to Canada, for the most part densely wooded, although farms are being cleared, is irregular in shape, about 12 miles in greatest length east and west by 10 miles in greatest breadth north and south. The highest portion, McQuaig's Hill, covered with trees, lies near the east side and is 480 feet high.

Channel Point is the northeastern extremity of Cockburn Island and the west entrance point of Mississagi Strait from North Channel of Lake Huron. It is gradually rounding, and, as might be anticipated, steep-to. (Northern shore of Cockburn Island described later.)

Cinder Point is the most easterly point of Cockburn Island and is $3\frac{1}{2}$ miles southward of Channel Point. Between them is formed a slight bay, the shores of which, as well as that of Cinder Point, are steep-to.

Shoals.—Nearly 1 mile south of the most easterly part of Cinder Point is a small rock, with 19 feet least water over it. Southwestward $1\frac{1}{2}$ miles from Cinder Point is the middle of a very shallow bank 1,175 yards long north-northeast by 590 yards wide.

Rickett Harbor.—The entrance to this boat cove, 590 yards long and 300 yards wide, is situated 2 miles southwestward from Cinder Point. Only 7 feet of water can be counted on in the entrance, with slightly deeper water inside. The east entrance point has shoal water extending 440 yards south from it.

A telephone cable is landed on the coast between Cinder Point and Rickett Harbor, the Manitoulin end being landed near Mississagi Strait Lighthouse.

Magnetic Island is a wooded island lying close to the shore 1 mile southwest of Rickett Harbor.

Anchorage in 4 to 5 fathoms over mud will be found 200 yards north of Magnetic Island, but the shelter from southerly winds is not good.

Castilian Shoal, almost awash, lies 1 mile southeast from Magnetic Island. The shoal is over 880 yards long north and south, 440 yards in width, with shoalest spot near the middle. The passage between Castilian Shoal and Magnetic Island is 880 yards wide and clean, with as much as 11 fathoms in it.

Clearing mark.—To pass east of Castilian Shoal keep Channel Point in sight east of Cinder Point 358° (N. $\frac{1}{4}$ E.).

Boom Point is the most southerly point of Cockburn Island. It lies 3 miles west-southwest from Magnetic Island, and between them the coast of Cockburn Island takes the form of three slight bays fronted by shoal water. From Boom Point a reef extends $1\frac{1}{4}$ miles southeastward, almost joining Middle Reef, and southward 1 mile from the same point, or about halfway to the southern extremity of Magnetic Reefs.

Magnetic Reefs lie $2\frac{1}{4}$ miles southeastward from Boom Point. There are at least five distinct banks with deep, crooked channels between, not to be recommended to anyone.

South Reef, the most dangerous, is 1 mile long in a north-northeast direction and 1,320 yards wide, with least water of 9 feet near the middle. Its southwestern extremity is a little over 2 miles south-southeast from Boom Point.

East Reef is awash in one spot which lies 2.3 miles 100° (ESE. $\frac{1}{4}$ E.) from Boom Point. The dry spot is steep-to on its east side, but very shallow water makes out south-southwest 1,175 yards, south-southeast over 590 yards, and northward nearly the latter distance.

North, Middle, and West Reefs, being masked by the other two reefs, are of less importance.

Caution—Directions.—Masters of vessels rounding Magnetic Reefs must use great caution, as no good clearing marks could be discovered. Those having sextants, by keeping the angle subtended by Cockburn Island less than 85° , will not be less than 1,320 yards south or southeast of the reefs. The master of a vessel certain of his compass error may haul into the strait when Mississagi Strait Light bears 41° (NE.) until Channel Point comes in sight east of Cinder Point 358° (N. $\frac{1}{4}$ E.).

Pulpwood Point.—From Boom Point the southwest coast of Cockburn Island trends northwestward, almost straight, $4\frac{1}{4}$ miles to

a small cove and boat landing known as Hyndman Bay, close north-east of Pulpwood Point. This stretch of boulder shore is fringed with shallow water for 200 yards, as is also the south side of Boom Point itself. Pulpwood Point is an insignificant projection from which shoal water extends southward over 590 yards.

McKay Reef, with 13 feet least water on it, lies 1,320 yards southwestward from Pulpwood Point. The shoalest spot is near the middle of the reef, which is 440 yards long north and south and 200 yards wide. It is separated from Wagosh Reef by a passage over 880 yards wide and 7 fathoms deep.

Smith Point, long and narrow, is the southwest point of Cockburn Island, and lies with its southeastern extremity 2 miles westward from Pulpwood Point, the two inclosing Wagosh Bay. From Smith Point shoal water extends 440 yards southward and over 590 yards southeastward.

Wagosh Bay.—From Pulpwood Point the shore trends north-westward $1\frac{1}{4}$ miles, then west the same distance, and finally southward $1\frac{1}{2}$ miles to Smith Point, thus forming Wagosh Bay, the shores being lined with shoal water to 880 yards. Excellent anchorage and shelter from westerly winds may be had in Wagosh Bay between the reef and the bank from the west shore in 3 to 5 fathoms, over sand and mud.

Wagosh Reef, with 7 feet least water near its southern end, lies $1\frac{1}{4}$ miles eastward of Smith Point, and runs to the shore of the bay 1 mile northward.

Kitchener Island.—From Smith Point the coast runs north-westward 2 miles to the southern extremity of Kitchener Island, which almost joins Cockburn Island. Kitchener Island, formerly called Little Cockburn Island, low and well wooded, is over 1,320 yards long north and south by 1,175 yards in breadth at its north end, whence shallow water extends northward 440 yards. The island is crescent shaped, the bay being on the east side. The southwest and west sides are fringed with shoal water for 300 yards.

Herschell Island, 250 yards long and the same distance from the coast of Cockburn Island, lies nearly 1 mile northeastward from Kitchener Island, the bay between being very shallow and foul.

Anchorage.—Southeastward of the line joining the north points of Kitchener and Herschell Islands and close to the former will be found excellent anchorage in 3 to 5 fathoms over sand and mud with shelter from almost all winds.

Wheeler Reef, 5 feet high and small, is situated over 590 yards southwestward from the southwest side of Kitchener Island. Shoal water extends from it nearly 590 yards southward and 440 yards northwestward. The northeast side may be approached to within

100 yards. The passage between it and Kitchener Island is 200 yards wide with a depth of 4 fathoms.

Monk Point, which may be considered the eastern entrance point of False Detour Passage from North Channel of Lake Huron, is situated 6 miles northeastward from Herschell Island, the coast being generally clean outside the distance of 200 yards excepting the bay midway between, whence very shoal water makes out over 590 yards. The north shore of Cockburn Island, between Monk and Channel Points, is described later.

False Detour Channel, $6\frac{1}{2}$ miles long in a northeasterly direction, forms part of the boundary line between Canada and the United States. It has Cockburn Island for its southeast and Drummond Island for its northwest shore.

Marble Head is a gradually rounding wooded headland about 100 feet high, forming the northeastern extremity of Drummond Island and the northwest entrance point of False Detour Channel from North Channel to Lake Huron. Marble Head is steep-to. The northeast and north shores of Drummond Island are described later.

Southeast shore of Drummond Island.—This coast from Marble Head trends in a generally south-southwest direction $5\frac{1}{2}$ miles to the unnamed southeast point of Drummond Island, and may be approached to 200 yards excepting the shores of the small bays, whence shoal water extends 590 yards. The narrowest part of False Detour Channel, 1 mile wide between the banks, is abreast of Kitchener Island.

A rock, with 33 feet least water upon it, lies $3\frac{3}{8}$ miles 21° (NNE. $\frac{1}{4}$ E.) from the northern point of Kitchener Island and about $1\frac{1}{8}$ miles off the southeastern shore of Drummond Island.

A rock with 10 feet least water upon it lies 1,320 yards in a southwesterly direction from the southeast point of Drummond Island.

Clearing mark.—Marble Head of Drummond Island touching the southeast point of the same island bearing 26° (N.N.E. $\frac{1}{4}$ E.) leads 880 yards southeast of the rock.

Anchorage with shelter from westerly winds in 3 to 9 fathoms, over mud, will be found off the middle of the southeast coast of Drummond Island. The rest of False Detour Channel is too deep for anchorage.

The south shore of Drummond Island is decidedly broken and marked by many indentations, outlying islands, and shoals. From east to west the largest natural harbors are Big Shoal Cove, Huron Bay, Island Harbor, and Whitney Bay, with depths of 4 to 7 fathoms over clay and rock. Owing to the numerous obstructions, these harbors should not be entered in foggy weather, nor without charts and local knowledge.

Harbor Island.—The southeastern extremity of this island lies $1\frac{1}{2}$ miles westward of the southeastern extremity of Drummond Island, the shore being indented by two shallow bays nearly 1 mile in depth. The points have shoal water extending from them a distance of less than $\frac{1}{4}$ mile.

Big Shoal Cove.—From Harbor Island the shallow shore runs for 2 miles in a west-northwest direction to the east entrance point of Big Shoal Cove, a bay 1,320 yards deep from the line of its entrance points, containing good shelter in a depth of 4 fathoms over clay.

Big Shoal, whence doubtless the above cove takes its name, and with only 2 feet water over it, extends $1\frac{1}{2}$ miles in a southwesterly direction from the cove's east entrance point.

Scammon Point, forming the west entrance point of Big Shoal Cove, is situated 3 miles west-northwest from Harbor Island, and between the point and Big Shoal are two reefs, the western with 5 feet and the other with 10 feet water on it, forming dangerous obstructions in entering Big Shoal Cove.

Scammon Cove.—From Scammon Point the coast of Drummond Island takes an abrupt turn northward for 2 miles and then west-southwest for $3\frac{1}{4}$ miles forming a bay with depths under 15 feet.

Meade Island, occupying the middle of Scammon Cove, is 1,320 yards long north and south and is connected to the northwest side of the cove by very shallow water.

Reefs.—Distant $1\frac{1}{2}$ miles southwestward of the south point of Meade Island is a horseshoe shaped reef of dry bowlders 880 yards in diameter. Midway between it and Meade Island is an equal sized but covered bowlder reef. Between the bank extending 440 yards from the south point of Meade Island and the northeast reef, there are depths of 5 to 7 fathoms and similar depths between the two reefs.

The indented, though generally straight, shore for 3.6 miles west-southwest of Meade Island is fringed with shallow water for 590 yards.

Gravel Island, 590 yards long north and south, and narrow, lies in the mouth of Huron Bay nearly midway between Scammon Cove and Point Detour Lighthouse, distant about $7\frac{1}{2}$ miles from each.

Holdridge Shoal, with 6 feet water over it, is a dangerous obstruction lying 2 miles 122° (SE. $\frac{3}{4}$ E.), from the south point of Gravel Island. It is also 1.3 miles from the nearest shore, and, from the shoal, Point Detour Lighthouse is in range with the south side of Espanore Island bearing 287° (WNW. $\frac{1}{4}$ W.). To lead southward, therefore, of this danger, the lighthouse (at night, the light) should be kept well open southward of Espanore Island.

Huron Bay.—Between the entrance points this bay is 2 miles wide, and north from that line is 2 miles deep. From the south point

of Gravel Island a shallow spit extends in the line of the island nearly 880 yards. Eastward from that island over 880 yards are rocky ledges which almost join the shallow water from the east side of the bay, having 5 to 13 feet over them. There is a narrow channel between Gravel Island and the northwest shore of Huron Bay, but the best passage, nearly 880 yards wide, is eastward of the island, between it and the rocky ledges just mentioned.

Espanore Island, 1,320 yards long in a northeast direction and 590 yards broad is situated 3 miles westward from Gravel Island, nearly 4 miles east-southeast from Point Detour and 880 yards south-east from Anderson Point, being joined thereto by two small islands and a shallow bank.

A rocky bank with 3 to 4 feet water over it extends 880 yards eastward from the northeast point of Espanore Island, narrowing the channel into Island Harbor to 440 yards. Rocky ledges with bowlders extend the same distance southward from the southwest point of the island.

Island Harbor is the limited space with depths of 5 to 6 fathoms northeastward of Espanore Island. With the exception of a bank extending 880 yards southward from the eastern entrance point the east shore of the harbor is fairly steep-to, and should be kept on board in entering.

The islands at the bottom of the harbor are surrounded by shoals and a detached spot with 15 feet, lies 440 yards northeast of the northeast point of Espanore Island.

Whitney Bay is contained between Anderson and Barbed Points, the first situated 1 mile northwest of Espanore Island and the last $1\frac{1}{2}$ miles east-northeast from Point Detour Lighthouse. The east and northeast shores of Whitney Bay are indented by three principal coves, the bottom of the northernmost of which is $2\frac{1}{4}$ miles from the line joining the entrance points. The harbor is sheltered from southwest winds by a group of islands, the four principal of which reckoning from the west are Arnold, Bellevue, Bird, and Garden Islands. The harbor has depths from 5 to 6 fathoms. Garden and Bird Islands are connected by shallow water, but there are deep-water passages between Bird and Bellevue, Bellevue and Arnold Islands, and between the latter and the shore of Barbed Point.

Shoals in the approach.—A detached reef with less than 6 feet water on it, lies nearly 1 mile northwest from the southwest point of Espanore Island. A rock with 9 feet on it lies 1.6 miles from the southwest point of Espanore Island and on the line joining it to Point Detour Lighthouse.

A rock awash lies 1,320 yards southwest of Garden Island, and a bank with 6 feet upon it lies nearly 440 yards in the same direction

from Garden Island, leaving a depth of 6 fathoms between the island and bank.

Crab Island is the almost isolated extremity of Barbed Point, the southwest point of Drummond Island, and east entrance point of Detour Passage.

Crab Island Shoal.—This detached reef, *590 yards in length west-northwest and east-southeast, and with only 1 foot of water on it, lies 440 yards southward of Crab Island, and between them there is a depth of 6 fathoms.

Light buoy.—A red conical buoy, showing an occulting red light, is moored in 24 feet, near the western extremity of Crab Island Shoal.

CHAPTER XI.

NORTH CHANNEL—SOUTHERN SHORE, CHIPPEWA POINT TO MELDRUM POINT—NORTHERN SHORE, SICCORDE POINT TO BRUCE MINES—WEST SHORE, KOSHKAWONG POINT TO GRAVEL POINT—ST. JOSEPH CHANNEL.

The low water of 1895 (579 feet above mean tide at New York) was $2\frac{1}{2}$ feet below the datum used in this chapter.

The plan of this chapter is to describe the southern shore from west to east from Chippewa Point to Meldrum Point, the northern shore from east to west from Siccorde Point to Bruce mines, the western shore from Koshkawong Point to Gravel Point and then St. Joseph Channel.

Chippewa Point forms the northwestern extremity of Drummond Island and marks the limit of the Canadian survey in this direction. Shoal water extends 440 yards northward of Chippewa Point, and the shore is foul as far as the point 1 mile east of it.

Chippewa Bank, with $3\frac{1}{2}$ fathoms water on it, lies 1,320 yards northwestward from Chippewa Point.

Poe Point, $4\frac{1}{2}$ miles east of Chippewa Point, marks a slight change in the direction of the north coast of Drummond Island, and the coast between it and Reynolds Bay may be approached to 150 yards. For 1 mile westward of Poe Point the shore should receive a berth of 200 yards.

Reynolds (Birch) Point is nearer Chippewa Point than Marble Head, and its timber gives it the apparent height of 100 feet; its limestone shore is quite steep-to. On the northwest side of the point is Reynolds Bay, stony and shallow, extending in 1,320 yards.

Colton Bay, the mouth of which is blocked with stones, is situated about 2 miles southward of Reynolds Point. Off this bight a shallow rocky flat extends 440 yards.

Shoal Point.—From Colton Bay the shore trends southeastward for 1,320 yards to Shoal Point. Foul ground extends over 880 yards from this stretch of shore.

Humphrey Rock, with 11 feet least water on it (in low stages there may be $2\frac{1}{2}$ feet less), is an extensive and dangerous patch lying a little over 1,320 yards east-northeast from Shoal Point. Other patches, having $3\frac{1}{2}$ to $4\frac{1}{2}$ fathoms over them, lie southward and northwestward from Humphrey Rock. Northward from Shoal Point itself, not more than 9 feet will be found at 440 yards.

Clearing mark.—Poe and Reynolds Points touching, and bearing 293° (NW. by W. $\frac{1}{2}$ W.), lead well north of all this ground.

Lindsay Bank, with 13 feet water over it, is situated with its eastern extremity $1\frac{1}{2}$ miles southeastward from Shoal Point; vessels of large draft should not pass over this bank.

Glen Point is situated 4 miles southward of Shoal Point; a shallow gravel spit extends northwestward 590 yards from Glen Point.

Glen Cove is an indentation immediately west of Glen Point, being 1,175 yards wide and 880 yards deep, and under the gravel spit above mentioned a small vessel will probably be able to ride out a northeast gale in a depth of 12 to 15 feet. In taking up this berth, the west shore of the cove should be kept on board to clear the spit. There are a few shanties here (1890), looking as if it were occasionally a shipping place for ties and telegraph poles.

Sitgreaves Bay is situated next eastward of Glen Point. A vessel will find anchorage with suitable winds in 7 or 8 fathoms, mud bottom.

Pilot Cove (Harbor) is a snug little indentation on the northwestern extremity of Marble Head. It is possible, excepting in low stages, to take a short vessel drawing 9 feet water into Pilot Cove, inside which she will be perfectly sheltered from all gales. The narrow channel having a sharp turn, is difficult of access for a sailing craft without the assistance of warps. A vessel, if seeking shelter from heavy weather in North Channel, will do better by rounding Marble Head and anchoring under the eastern shore about halfway between Marble Head and the southeast point of Drummond Island; a vessel will here find a good berth near some pound net stakes in 4 to 5 fathoms clay bottoms.

Marble Head, previously described, is the northeastern extremity of Drummond Island. It is a gradually rounding wooded headland about 100 feet high, forming the northwest entrance point of False Detour Channel from North Channel of Lake Huron, and is quite steep-to.

Ontario Bank, an extensive elevation of the bottom, lies about $3\frac{1}{2}$ miles northeastward of Marble Head. The least water on Ontario Bank is 7 fathoms over rocky bottom, and the remarks about the soundings on Wiggins Bank are equally applicable to this bank for a vessel proceeding into Lake Huron by False Detour Channel from St. Joseph Channel.

False Detour Channel, previously described, lies between Drummond and Cockburn Islands.

Cockburn Island belongs to Canada, is about 9 miles in diameter, and is easily distinguishable by a broad and partly cleared hill nearly

3 miles back from the village of Tolsmaville, and called McQuaigs Hill, about 480 feet high.

Monk Point, is the northwestern extremity of Cockburn Island and may be considered the eastern entrance point of False Detour Channel from North Channel of Lake Huron; a flat extends 300 yards from the eastern part of the point. Speaking generally, the northern coast of Cockburn Island may be considered free from dangers, there being nothing farther from the shore than a stranger would naturally keep.

Thompson Point, the most northerly projection of Cockburn Island is low and wooded and may be approached to 150 yards. An indentation called by some Burnt Harbor is formed under and south-eastward of Thompson Point, and in the mouth of this indentation midway between the point and island 590 yards southeastward of it a vessel may anchor in 4 fathoms, sandy bottom, with shelter from westerly gales. The island just alluded to on the southeast side of the bay has shoal water extending 300 yards from its north side.

Pitman Bank.—Foul ground extends eastward from Thompson and northerly from Pitman Point as the northwest point of Tolsma Bay is called. These rocky patches have $3\frac{1}{2}$ fathoms over them, the outer and shoalest one named Pitman Bank being 1,175 yards offshore.

Wiggins Bank, with 9 fathoms least water on it, is the shoalest part of a raised plateau with less than 20 fathoms extending from the northeast side of Cockburn Island, the northeastern extremity with that depth being $3\frac{1}{4}$ miles from Channel Point. The soundings on this bank will be serviceable to a vessel bound from St. Joseph Channel to Mississagi Strait if enveloped in the fogs, which often roll in through the latter from Lake Huron in spring.

Tolsmaville (Cockburn Island Village) is situated in the southeast corner of Tolsma Bay 2 miles west from Channel Point.

There are two wharves, the eastern one being private property, while the other belongs to the Government. At the latter there was in 1890 a depth of 18 feet (in low stages there may be $2\frac{1}{2}$ feet less), but on account of a shallow bank between the two wharves the western side of the Government wharf is the preferable for a vessel to lie. The village is in telephonic connection with the Manitoulin Island system by means of a cable across Mississagi Strait. This system joins the telegraph at Little Current.

At the eastern wharf the water, except near the outer extremity, is shallow, but the Owen Sound and Collingwood steamers usually stop at it. The Government wharf is the better one to lie at for a lengthened period, but in a northerly gale considerable sea heaves in at both. A customhouse officer resides here and there is a post office.

Vessels running out of Lake Huron in heavy weather will find anchorage in 7 or 8 fathoms, sand and mud, in Tolsma Bay, 880 yards northwestward of the Government wharf, but should not hug Ross Point (separating Robinson and Tolsma Bays) too closely on account of a bank extending off 200 yards. Between Ross Point and the village is a considerable indentation with a sandy shore line and bottom, in which fishing boats are generally moored, it being too shallow and exposed for vessels of large draft.

In northerly gales fishing boats find good shelter in the northeast corner of this sandy bay. From the gravelly point sheltering this cove a shallow rocky bank extends half way to the wharves, and in approaching the latter care should be taken to keep northward of this bank. In proceeding to the west side of the Government wharf keep well out in deep water until the wharf is end on and then steer for it and make fast.

Robinson Bay is a broad indentation immediately westward of Channel Point, and a vessel running from Lake Huron in a south-west gale will find good anchorage in 4 to 6 fathoms over sand by not approaching the bottom of the bay nearer than 440 yards.

Channel Point is the northeastern extremity of Cockburn Island and the west entrance point of Mississagi Strait from North Channel of Lake Huron. It is gradually rounding, and, as might be anticipated, steep-to. The wooded land over Channel Point is about 100 feet high.

Meldrum Point forms the northwestern extremity of Manitoulin Island.

The northern shore will now be described.

Siccorde Point is the most outstanding island, $1\frac{1}{4}$ miles westward of Supply Point, and, being almost joined to others, gives this portion of the broken-up coast the appearance of a point. The bight between Joliette Islands and Siccorde Point is foul, and a vessel should not stand into a less depth than $4\frac{1}{2}$ fathoms.

Flat Point (Grande Batture, as some of the French half-breeds on this shore call it) is $4\frac{1}{4}$ miles westward of Siccorde Point, the coast line between them being indented by numerous little bays and fronted by small islands and rocks. Siccorde Point itself may be approached to 440 yards, but the bank extending from the shore between it and Flat Point gradually widens until abreast of the latter, when only 18 feet will be found over 1,320 yards from the shore. A reef of dry stones makes out from the islet at Flat Point 800 yards. A reef with 2 feet water on it lies southwest 590 yards from the outer end of the bowlders; on the northwest side of Flat Point is a broad cove open to the west, but in which a boat will find shelter in easterly gales.

Dobie Point is a slight projection $1\frac{1}{4}$ miles west by north from Flat Point, and 200 yards southeast of the point is a cluster of dry stones.

Le Sable, so called from its sandy beaches, is the Indian reserve situated midway between Flat Point and Thessalon. There are about 2 miles of this beach, the middle of which is situated south of Hagans Hill. The coast between Dobie Point and the west end of Le Sable is strewn with dry stones and sunken rocks, the edge of the 3-fathom bank extending on an average of 1,175 yards from it.

Butcher Boy Bank, with 10 feet water over it, lies over 1,320 yards from the shore 1.6 miles eastward of the eastern end of Le Sable. This danger lies also $4\frac{1}{4}$ miles west by north from Flat Point.

Hagans Hill is the partially cleared and conspicuous rise, 285 feet high, situated nearly 2 miles in from Le Sable.

Livingstone Creek is situated 2 miles west by north from the west end of Le Sable and $3\frac{1}{2}$ miles eastward of Thessalon. It is not discernible from the vessel's track, as it breaks through the shore line at an acute angle. It is too narrow and shallow to be of much commercial value, though logs are occasionally brought down. A small tug can carry 6 feet to the cottage situated 200 yards from the mouth. The shore between Le Sable and Livingstone Creek is very foul and not more than 3 fathoms will be found at over 590 yards from the shore.

Thessalon, with a population in 1911 of 1,945, is situated on the east side of the point from which it derives its name, and is $11\frac{1}{2}$ miles from Bruce Mines. The river of the same name flows through the town and debouches on the east side of the peninsula. On the east side of the town, in addition to private wharves, there is a Government wharf with protecting breakwater and sufficient water for the steamboats that frequently call here from Sault Ste. Marie, Owen Sound, Collingwood, and intervening ports.

The town is $1\frac{1}{2}$ miles from the Canadian Pacific Railroad and connected to it by motor bus. On the west side of the peninsula is a public wharf $1\frac{1}{4}$ miles from the lighthouse, and at the outer end the depth in 1914 was 20 feet, but at 150 feet toward the shore the depth was but 10 feet. The white spire of the Presbyterian Church, the numerous houses, and the smokestacks and sawdust burners of the mills (shut down in 1914) render the town easily discernible from the offing.

The coast between Livingstone Creek and Thessalon is very much indented and fronted by rocks and islets, close to which, however, the water is deep. Vessels will find good shelter for loading in the bay just east of the town, being sheltered by the scattered rocks.

Thessalon Point is the southern extremity of a remarkable peninsula sheltering the town from the west. At a little over 1,320 yards in from the point and a quarter of a mile from the mouth of the river the neck is only 33 yards wide. The extremity of the point may be approached to 200 yards.

Light.—A fixed white light, 30 feet above water, visible 10 miles, is shown from a white, square, wooden structure near the end of Thessalon Point.

Fog signal.—The fog signal is made on a hand horn, which answers vessels' signals.

Anchorage.—There is good holding ground and shelter from westerly gales on the east side of Thessalon Peninsula, in 5 to 6 fathoms, about halfway between the point and town, but with easterly gales considerable sea rolls in. In making Thessalon in thick weather it should be remembered that the 10-fathom curve approaches the extremity of the point to 590 yards, and the water should not be shoaled to less than this depth until the land is recognized or the fog horn heard.

Directions.—If from the east, the course from a position 1 mile 176° (S.) from Talon Rock to Thessalon Light is 287° (WNW. $\frac{1}{4}$ W.), and distance $20\frac{1}{2}$ miles. If wishing to make fast to the southern wharf, as soon as Roberts Hill (at the back of Macbeth Bay) is over the end of the southern wharf bearing 320° (NW. $\frac{1}{4}$ N.), the latter may be steered for.

If from the west, Thessalon Point may be rounded at 200 yards and the wharves steered for.

Macbeth Bay is an excellent harbor 3 miles northwestward from Thessalon Point. It is the first landlocked harbor on the north shore westward of Serpent Harbor, distant in a straight line $44\frac{1}{2}$ miles, and may come into importance at some future date as a tributary port for the Sault branch of the Canadian Pacific Railroad, which passes over the creek close to the bottom of the harbor. In 1914 a sawmill situated at the mouth of the creek was in active operation, the burner, smokestack, and extensive lumber piles being conspicuous from the offing. As a shipping port for ore or lumber it would offer every facility. It is sheltered from the more open water of North Channel of Lake Huron by the following islands:

Bald Rock, 10 feet high, as its name indicates, is a bare small rock lying 100 yards off the point situated $1\frac{1}{4}$ miles north by west from Thessalon Point. The track to Macbeth Bay generally used is nearly 100 yards west of this rock.

Mill.—In the bay 300 yards northward of Bald Rock are the conspicuous burner, smokestack, and loading pier of a sawmill at present (1914) shut down.

Gooseberry Island, 10 feet high and almost divided in the middle, is situated over 2 miles northwest by north from Thessalon Point. It is separated from Chevalier Islands northwest of it by a channel 1,320 yards wide, which, although used by the *Bayfield* in the course of the survey, is not to be recommended to strangers on account of the rocks lying westward of Gooseberry Island. A dry stone lies 300 yards westward of Gooseberry Island, and two rocks 7 feet high are situated about the same distance eastward of its south point.

Gereaux Rock, with 9 feet on it, lies nearly midway between these two dry rocks and the main shore.

A small sparsely wooded island, 7 feet high, lies 440 yards eastward of the north point of Gooseberry Island, and between them is a depth of 11 feet. The north and east sides of this little island are steep-to. A narrow gravel spit extends in a northeasterly direction 100 yards from the north point of Gooseberry Island.

Kalulah Rock, 9 feet high, lies 1,320 yards west from the south point of Gooseberry Island, and on this line and nearly mid distance is a rock with 7 feet of water over it. This spot, together with two other patches with 11 and 15 feet over them nearer Gooseberry Island than Kalulah Rock, renders this passage difficult to navigate without the aid of buoys. A small rock with 6 feet water over it lies 440 yards westnorthwest from Kalulah Rock.

Chevalier Islands take their name from a French half-breed who at one time resided on the western and larger of the two islands which shelter the harbor; the larger island is 28 feet high. A rock with 10 feet over it lies 300 yards eastward of the eastern Chevalier Island, leaving a depth of 3 fathoms between them. A flat extends 150 yards northward from the western extremity of the big Chevalier Island.

St. Ange Island, 10 feet high, is the little wooded one on the east side of Macbeth Bay and a little more than 590 yards southward from the mouth of the creek. The depth of 3 fathoms approaches to within 200 yards of the south side of St. Ange Island. In the bottom of the bay is the sawmill already mentioned.

Frechette Island, 17 feet high, is a round, smooth islet 440 yards westward of the big Chevalier Island, being joined thereto by rocks dry and sunken. The deepest passage into Macbeth Bay, though not the one generally used, will be found westward of Frechette Island, between it and the little group 12 feet high lying close to the northwest shore.

Roberts Hill is a sparsely wooded, conspicuous eminence, 400 feet high, situated 1.6 miles north by west from the bottom of Macbeth Bay.

Africa Rock, 7 feet high, consisting of a flat rock with a few blocks of stone scattered about it, is situated eastnortheast 2.1 miles from the south point of Birch Island or southwest 1.1 miles from Frechette Island. A rock awash lies nearly 590 yards eastward from Africa Rock, and a patch with 15 feet on it is situated northeast 1,175 yards from the same. Shoal water encircles Africa Rock for 200 yards.

Maggie Rock, with 13 feet over it, is an outlying patch lying a little over $1\frac{1}{4}$ miles southeast by east from Africa Rock.

Asia Rocks, 4 feet high, close together and dark colored, lie 1 mile west by south from the south point of Africa Rock, and a patch with 11 feet water on it is situated nearly 440 yards southward of these rocks. Several shoals lie between them and the main shore, but will not be particularized as the passage northward of Asia Rocks is not to be recommended.

Birch Island, about 20 feet high and thickly wooded, is nearly 1,320 yards long north-northwest and south-southeast, and over 590 yards in maximum breadth. It lies 1 mile westward from Asia Rocks, and is connected to the main shore by a bank on which there is only sufficient water for large boats or small tugs. The south point, as well as the islet 4 feet high with a single bush on it (1914) lying 150 yards eastward of it, are steep-to, and vessels proceeding to Bruce Mines or St. Joseph Channel may approach it to 100 yards.

Directions.—Approaching Macbeth Bay from the east, when 880 yards westward of Thessalon Point Lighthouse steer for Bald Rock bearing north 0° (N. $\frac{1}{2}$ E.). Pass 100 yards west of it and 200 yards from the mouth of the first bay north of it, using the lead. When Kalulah Rock is touching the south point of Gooseberry Island, bearing 268° (W. $\frac{1}{2}$ N.) a vessel will be passing Gereaux Rock (which should be buoyed) about 150 yards westward of her. When across the narrow ridge with 16 feet water (in low stages there may be $2\frac{1}{2}$ feet less), it will deepen to 4 fathoms, and a vessel should haul northwestward to pass 50 to 100 yards northeastward of the little round wooded island, and thence proceed to the anchorage under Chevalier Island in $3\frac{1}{2}$ to 4 fathoms mud bottom.

If entering from the west; when past the islet at the south point of Birch Island, keep the south sides of it and Cedar Island in range bearing 261° (W. $\frac{1}{2}$ S.) until the summit of Roberts Hill comes over the west end of Frechette Island and steer for this range bearing 5° (N. $\frac{1}{2}$ E.) until 300 yards from Frechette Island. Pass 50 yards westward of the latter (this side is steep-to), haul eastward in mid-channel and anchor under the two Chevalier Islands, as convenient. This is the deepest passage in; and, if the range is rigidly adhered to, not less than 5 fathoms will be had until inside Frechette Island.

In thick weather a vessel should not shoal to less than 10 fathoms between Birch Island and Thessalon Point.

Cedar Island, 10 feet high, is situated $1\frac{1}{2}$ miles westward of Birch Island and is somewhat larger than the latter, but being flat and thickly wooded presents a similar appearance. It is 2.6 miles east-northeast from Big Point of St. Joseph Island and $4\frac{1}{2}$ miles south-eastward from the wharves at Bruce Mines. Its western side may be approached to 200 yards, but its south point should receive a berth of 590 yards.

Calf Island, small, low, and thickly wooded, lies a little over 590 yards eastward of Cedar Island, being joined thereto by a gravel bank on which there is less than 6 feet water. The east side of Calf Island may be approached to 200 yards, but its north point should receive a berth of double that distance.

The coast between Birch Island and Bruce Mines is indented by several bays, the eastern half being almost hidden by several large islands which afford a smooth channel for boats in rough weather.

Long Island, characterized by its name, and the middle one of the string, is situated $1\frac{1}{2}$ miles northwest from Birch Island.

Alicia Rock, with 4 feet on it, lies 1,175 yards southeastward from the west point of Long Island.

Long Bank.—At a distance of a little over 590 yards from the same point of Long Island, is a small rock 3 feet high, and from it a cluster of sunken rocks with less than 6 feet water on some of them extends, under the name of Long Bank, for a distance of nearly 1 mile, the western end being distant 1,175 yards south-southeast from the small but conspicuous islet with tall pines on it called Little Island. Patches with 12 to 15 feet water over them lie southward of the main bank, but the whole may be passed southwestward of them by keeping the south end of Calf Island touching the north point of Cedar Island, bearing 121° (SE. by E.), but should not be continued too far northwestward, as it leads very close northeast of Prout Rock.

Pallideau Island, the largest and northwesternmost of the string, is situated 590 yards northwest of Long Island, but unlike it is high, the summit attaining a height of about 80 feet.

Joe Dollar Bay is the large indentation northward of Pallideau Island.

Eagle Point applies to the promontory dividing the last-mentioned bay from a broad indentation, the northern shore of which takes the form of two shallow coves, that nearer Eagle Point being called Hay Bay, and the northwestern arm Garden Bay.

Garden Bay.—Between this bay and Jacks Island will be noticed the buildings of the Martin International Trap Rock Co., and the

ore-stamping mill. One-third of a mile northwestward Eagle Point will be found good anchorage in 3 fathoms over mud and with shelter from easterly gales.

Little Island lies 440 yards southwest from Eagle Point, and is a conspicuous feature in approaching the harbor of Bruce Mines from the southeast. With the exception of a narrow spit extending 100 yards from the western side, the island has good water about it. The track to Bruce Mines passes about 590 yards southwestward of Little Island.

Bruce Mines takes its name from the old Bruce copper mine, which was opened in 1846, followed by the Wellington in 1858; both belong now to the Bruce Mines Copper Co. (Ltd.) of St. Catharines, and were operated periodically between 1900 and 1909, since then they have stood idle. The town is supported by a good farming community and has for industries a planing and saw mill (not working 1914); also a large rock-crushing plant under the name of the Martin International Trap Rock Co. About $\frac{1}{4}$ mile northwest of the Martin International Trap Rock Co.'s works are the conspicuous smokestack and plant of the ore-stamping mill, the property of the Bruce Mines Copper Co., but now used in connection with the above works. There is a small sawmill on McCort Point, on the west side of the bay (shut down in 1914).

The town had, in 1911, a population of 689, good stores, a public school, and churches of the principal denominations. It is a customs port of entry, and steamship communication is had with the principal North Channel ports, Owen Sound, and Collingwood. It has a telegraph office, the Canadian Pacific Railroad station under the name of Bruce being situated about 2 miles inland; it has also a branch of the Royal Bank. Two wharves project from the middle of the bay, the outer ends being 200 feet apart; the eastern one, in poor condition, is the property of the Bruce Mines Copper Co., and the western one, running out in a southeast by south direction 1,000 feet, is the property of the Government.

Dredged channel.—Leading to the outer end of the Government wharf is a channel 150 feet wide and 870 yards in length with a depth of 16 feet at low stages. Its approximate direction to the wharf is 327° (NNW. $\frac{1}{2}$ W.) and the western edge is marked by four black spar buoys.

Jacks Island, 40 feet high at its southern end, is situated nearly 1 mile northwest from Eagle Point and 880 yards southeast from the above wharves. It is connected to the shore by an iron tramway, and from its southern side projects an iron coal-landing wharf erected in about 1902, when the mines were again opened up and worked for a short time. The depth, 300 yards from the south side of Jacks Island, is 3 fathoms.

McKay Island is the outer of two islands sheltering the harbor from the southwest. A boat passage exists between McKay Island and the other called French Island, as also between the latter and McCort Point. A rocky spit extends 100 yards from the east point of McKay Island, to avoid which keep Burroughs house in range with the west side of Jacks Island, bearing 353° (N. $\frac{1}{4}$ W.).

Lights—Government Wharf.—A fixed red light, 12 feet above water, visible 5 miles, is shown from a gray rectangular warehouse on the outer end of the wharf.

McKay Island.—A fixed white light, visible 11 miles, is shown from a white square wooden dwelling on the east end of the island.

Anchorage.—On the northeast side of McKay Island there is good anchorage in 3 fathoms.

Prout Rock, with 7 feet of water on it, lies 1 mile 140° (SE. $\frac{3}{4}$ S.) from McKay Island Light. The mark above mentioned leads west of it, and the south end of Birch Island touching the north point of Calf Island bearing 105° (ESE. $\frac{3}{4}$ E.) leads southward of Point Rock.

Buoy.—Prout Rock is marked by a red spar buoy.

McKay Reef, awash, is situated southwest by west, a little over 1,320 yards from McKay Island Lighthouse.

Beacon.—The reef is marked by a triangular open slat-work beacon painted white, but should it be down, the village of Hilton touching the north side of Gravel Point, bearing 254° (W. by S.), will lead south of it and the other shallow spots about it.

One Tree Island, so called from a conspicuous pine tree growing on it in 1890, is the next prominent feature on the north shore westward of McKay Island, from which it is nearly 3 miles. Many sunken rocks lie off One Tree Island, but as the passage northward of McKay Reef is not recommended only the most outlying shoals will be described.

Jennie Rock, with 5 feet water on it, lies 1,175 yards southeast by east from One Tree Island.

Directions—Birch Island to Bruce Mines.—Pass 200 yards southwest of Birch Island and steer for Little Island, passing a good 440 yards northwestward of Calf Island; when clear of the spit off the latter, keep a more westerly course so as to gradually bring the south point of Calf Island, touching the north end of Cedar Island, bearing 121° (SE. $\frac{1}{4}$ E.). This range astern will lead between Long Bank and Prout Rock. When the latter is passed, the public wharf on end, bearing about 327° (NNW. $\frac{1}{2}$ W.), may be steered for, which will lead to the entrance of the dredged cut.

If passing southward of Cedar Island (the better track for a stranger), give its southern side a berth of 880 yards, and when ap-

proaching Prout Rock, if the buoy be not on it, bring the west side of Jacks Island as directed in the next paragraph.

If from the passage between St. Joseph and Drummond Islands, a vessel will pass 440 yards west of Prout Rock by keeping Burroughs's house in range with the west side of Jacks Island bearing 353° (N. $\frac{1}{4}$ W.).

Outlying islands and shoals.—**Cumberland Rock**, 3 feet high, occupies a solitary position 3.2 miles 243° (WSW.) from Talon Rock near La Salle Island, and $2\frac{1}{2}$ miles 97° (E. by S.) from the northern extremity of East Grant Island. A spur makes out 50 yards in a northeast and 100 yards in a southeast direction. A rock with 15 feet on it lies nearly 440 yards west-southwest from Cumberland Rock; with these exceptions the water is deep about it.

Grant Islands.—This name applies to a group occupying a space of $3\frac{1}{2}$ miles east by north and west by south. They are called East, Middle, and West Grant Islands, the first mentioned being the largest and highest, besides containing the fishing establishment. The Middle Island is small and separated from the first mentioned by a deep channel. A passage not so deep or broad isolates it from West Grant, and Bird Island northward of the latter.

East Grant Island has an extreme length of 1 mile in a north-northeast direction and attains an elevation of 65 feet. Its northwest side is indented by a broad open bay, on the northern part of which is situated an oval-shaped island 26 feet high named Fishery Island, containing the fishing establishment and wharf at which there is a depth of 10 feet. A vessel making fast to this wharf will have shelter from all winds, but in a heavy northwest gale there is considerable undertow, requiring better fastenings than existed in 1890.

This little island is separated from the main island by a channel 150 yards broad through which 16 feet may be carried, but on account of its sharp turn is not recommended. A vessel with a steam windlass seeking shelter in an easterly gale and finding the wharf occupied will find anchorage in the bay in 13 fathoms over mud. In heavy westerly weather a vessel will find good anchorage under West Grant Island.

A rock awash lies 250 yards northwestward of Fishery Island and generally shows itself by breaking; and a shallow spur extends 100 yards farther westward. A passage for a light draft vessel exists between the rock awash and the island. The north side of East Grant Island may be approached to 200 yards, there being 12 fathoms at this distance, but from the northeastern point a reef extends in an easterly direction nearly 440 yards.

Herbert Island, about 8 feet high, is situated 880 yards eastward of the southern extremity of East Grant Island. On the south side of Herbert Island the water is deep, but on the east and northwest

sides shoal spits extend 200 yards. A cluster of dry stones lies 440 yards north-northeast of Herbert Island and the same distance from the southeast side of the main island; shallow spits extend 200 yards in a northwesterly and opposite directions from this cluster. The southeast side of the main island should not be approached nearer than 1,320 yards, at which distance there is 12 fathoms. An isolated lump with 15 feet on it lies 200 yards off South Point of East Grant Island.

Ivor Rocks, the highest of which is 7 feet high, lie close to the extremity of the long point forming the south side of the bay of East Grant Island already mentioned, leaving a narrow passage for a small tug between them and the point of the main island. The depth of 12 fathoms will be found 100 yards westward of the largest Ivor Rock, but in proceeding to the wharf the northern small rock of this group should not be approached nearer than 300 yards.

Middle Grant Island, about 30 feet high, is triangle shaped, the sides being about 300 yards long, and deep water approaches close to its northwest side. Shoal water makes out from its southwest side 200 yards, while eastward and northward from it are the following isolated rocks:

Leo Rock, with 6 feet water on it, lies nearly 440 yards north-northeast from the north gravelly point of Middle Grant Island, and between them there is a depth of 7 fathoms.

Clearing mark.—To pass northward of this rock keep the northwest point of West Grant Island well open northward of Anchor Island bearing 150° (WSW. $\frac{1}{2}$ W.).

A rock with 11 feet on it lies 300 yards eastward from the same extremity of Middle Grant Island, and two rocks with 10 and 5 feet over them lie southeast by east 1,175 yards and 590 yards, respectively, from Middle Grant Island.

Clearing mark.—The northwest side of Fishery Island in line with the point east of Ivor Rocks, bearing 41° (NE.), leads south-east of these patches.

West Grant Island is beset by shoal water and very much indented, the shallow bay on the southwest side of it (containing the remains of a small fishing establishment), almost dividing it.

Bird Island, 12 feet high and in two parts, is situated $\frac{1}{4}$ mile northward of the main island, and helps to shelter the anchorage. With the exception of a spur extending 50 yards from its eastern extremity, both it and the little dry rock north of it are steep-to.

Anchor Island, 6 feet high, lies on the north side of the main island, and rather nearer to it than Bird Island, from which it is separated by a passage 270 yards broad with a depth of 5 fathoms. Anchor Island is joined to the northwest point of the main island by a chain of shallow sunken rocks, affording no passage for anything

but boats. A narrow gravel spit extends 100 yards from its southern extremity toward the main island.

A rock with 13 feet water on it lies on a line joining the eastern part of West Grant to Middle Grant Island, and is rather nearer the former. A shallow flat extends 440 yards in a southeasterly direction from the same extremity of West Grant Island.

A reef with 5 feet water over it lies 440 yards southwest of the mouth of the old fishing cove on the southwest side of the island, and almost joining the shore.

Horne Rock, awash and generally breaking, is situated over 590 yards west by south from the western end of West Grant Island. Shoal water runs from the rock halfway to the western extremity of West Grant Island, leaving a passage 150 yards wide, through which 4 fathoms may be carried in an emergency.

Rocks with less than 6 feet water on them extend 350 yards northward from the northwestern extremity of West Grant Island, and serve to break the sea and so smooth the water at the anchorage. In passing between Bird and Anchor Islands the master of a vessel must be careful to keep northward of this shallow ground.

Barrett Bank, with 10 feet water on it, lies $1\frac{1}{2}$ miles west by south from the western extremity of West Grant Island.

Clearing marks.—To pass westward of this bank, keep East Hill (4 miles north of Thessalon) in range with the northeastern extremity of Bigsby Island, bearing 327° (NNW. $\frac{1}{2}$ W.). To pass between Barrett Bank and Horne Rock, keep Roberts Hill a little inside or southwest of the same extremity of Bigsby Island, bearing 316° (NW. $\frac{1}{2}$ N.). The north end of East Grant Island in range with the north side of Bird Island, bearing 79° (E. $\frac{1}{2}$ N.), leads northward of Barrett Bank, and a vessel may approach the south side of the bank until the south points of East and West Grant Islands are in range, 83° (E. $\frac{1}{2}$ N.).

Fisk Reef, with 2 feet water on it, is a dangerous obstruction of solid rock and stones, 400 yards long southwest and northeast, situated with the first-mentioned extremity 2.6 miles 172° (S. $\frac{3}{4}$ E.) from the east point of Bigsby Island. This shallow patch stands near the southwest end of a bank, which under 10 fathoms is $1\frac{1}{2}$ miles in extent. On this same bank there are two other patches with $3\frac{1}{2}$ fathoms on them. A channel over 1 mile broad exists between this 10-fathom bank and Bigsby Island, and another 880 yards broad between this bank and Barrett Bank.

Caution.—Care must be taken at night or in thick weather when passing the reef, as 10 fathoms will be found 200 yards southwest and south of it.

Clearing marks.—To pass southward of the reef and northward of Barrett Bank keep the northern extremities of East Grant and

Bird Islands in range, bearing 79° (E. $\frac{1}{2}$ N.). The southern extremities of East and West Grants in range bearing 83° (E. $\frac{1}{4}$ N.) will lead 1,175 yards south of Fisk Reef. The south ends of East Grant and Anchor Islands in range with the north point of West Grant Island, bearing 92° (E. $\frac{1}{4}$ S.), leads close northward of this reef.

The East Hill mark for leading west of Barrett Bank also leads 1,320 yards northeastward of Fisk Reef, but over one of the $3\frac{1}{4}$ -fathom patches, about which, however, there need be no anxiety, as it has been well examined. The west fall of Hagans Hill in range with the eastern extremity of Bigsby Island, bearing 358° (N. $\frac{1}{4}$ E.), leads west, and the opposite end of Bigsby Island under East Hill 329° (NNW. $\frac{1}{4}$ W.) leads very close northeast of Fisk Reef.

Anchorage.—Good shelter in westerly gales may be had north of the eastern part of West Grant Island, sheltered from north winds by Bird Island, from west winds by Anchor Island and the spit from its south end, and by the shoals which break the sea between Anchor Island and the west point of West Grant Island. A vessel should anchor in 4 to $4\frac{1}{2}$ fathoms clay bottom, just sufficiently far offshore to swing clear of Anchor Island Spit (which is steep-to) and the coast of the main island. The steamer *Bayfield* in the prosecution of the survey in 1890 found the anchorage very useful and safe in westerly gales. In easterly weather a vessel will be more comfortable at East Grant Island.

Directions.—In daylight and clear weather a vessel may pass between the Grant Islands by the following directions:

If from the east, pass 440 yards or less southwestward of East Grant Island and steer to pass about that distance west of Ivor Rocks to make sure of being eastward of Middle Grant Shoals. When the northwestern extremity of West Grant opens northward of Anchor Island, bearing 250° (WSW. $\frac{1}{4}$ W.), Leo Rock will be passed and a vessel may steer for Bigsby Island.

A vessel may pass through between Middle and West Grant Islands by keeping the gap in the two parts of Bird Island in range with the northeastern extremity of Bigsby Island, bearing 299° (NW. by W. $\frac{1}{4}$ W.). She may then pass on either side of Bird Island and steer thence for Bigsby Island. To pass between the Grants and Bigsby Island follow the various leading marks for clearing Fisk Reef and Barrett Bank, previously given. At night or in thick weather do not shoal to less than 20 fathoms on the south side of the Grants and Fisk Reef.

Bigsby Island, 5 feet high, wooded and almost divided into three distinct islands by shallow bays, lies with its northeast point $7\frac{1}{4}$ miles, bearing 284° (WNW. $\frac{1}{4}$ W.), from the north point of East Grant Island and about 8 miles 124° (SE. $\frac{1}{4}$ E.) from the lighthouse on Thessalon Point. Considering its ragged shape, the water is deeper

about it than would be expected. The west side is the foulest, there being only 7 feet 590 yards from the sharp stony northwest point. Shoal water extends nearly 440 yards from the south and southeast sides. The otherwise boldness of the northeast gravelly extremity is spoiled by a narrow shallow gravel spit extending nearly 100 yards.

A flat extends southwestward from Bigsby Island, on which not less than $3\frac{1}{2}$ fathoms was found situated a little over 1,320 yards westward from the west point of the island. In passing southward of Bigsby Island it should receive a berth of 880 yards.

Serpent Island is situated $5\frac{1}{4}$ miles 16° (N. by E. $\frac{1}{4}$ E.) of Chipewa Point. The ground of the island is low, but the timber gives it the appearance of a compact little island 440 yards long north and south. The north point is clean, but shallow water extends 250 yards eastward of the island, and a bank with 13 feet over it extends 590 yards from the southwest coast of the island.

Sulphur Island is nearly 880 yards long north and south, and, including the small islet called Maggs Island, on the west side, is about the same breadth. The island, 40 feet high, lies 3 miles from Poe Point, the boundary between Canada and the United States passing between them.

Light.—A fixed white light, 49 feet above water, visible 12 miles, is shown from a white octagonal tower on the southern end of Sulphur Island.

Fog signal.—The fog signal is made on a hand horn, which answers vessels' signals.

The lighthouse point may be approached to 150 yards, and the east side of the island is quite steep-to, but from the north and northeast sides a shallow ledge makes off 300 yards. Shallow water extends the same distance from the southwest shore of this island and 440 yards northwesterly from Maggs Island.

A rock with 12 feet over it lies 440 yards southwest by south from Gull Island, and to pass southwest of both this rock and Sam Smith Rock keep the lighthouse point of Sulphur Island opened south of Maggs Island, bearing 130° (SE. $\frac{1}{4}$ E.). The north side of Gull Island may be approached to 200 yards, and keeping mid-distance between Sulphur and Gull Islands a vessel will find a depth of 8 fathoms.

In thick weather a vessel will keep southward of Sulphur and Gull Island shoals by not standing into less than 12 fathoms.

A rocky patch with a least depth of 36 feet lies 3 miles south-eastward of Sulphur Island.

Shepherd Reef, with 5 feet water over it, is a dangerous obstruction, lying $1\frac{1}{2}$ miles 47° (NE. $\frac{1}{4}$ E.) from the north point of Sulphur Island; within the depth of 3 fathoms the shoal is nearly 440 yards in diameter.

Clearing marks.—To pass southward of Shepherd Reef, keep Chippewa Point of Drummond Island closed or in range with the northwest point of Sulphur Island, bearing 238° (SW. by W. $\frac{1}{2}$ W.). The whole of Maggs Island open northwest of Sulphur Island, bearing 217° (SW. $\frac{3}{4}$ S.) leads northwest. The southwest point of Cedar Island in range with the southwestern extremity of Thessalon Island, bearing 303° (NW. $\frac{3}{4}$ W.), leads 300 yards northeast, and the same part of Thessalon Island touching the north point of Cedar Island, 313° (NW. $\frac{1}{2}$ N.), leads nearly the same distance southwest of the reef.

Approaching the reef from the east in thick weather, a vessel should not shoal to less than 12 fathoms, as that depth will be found 300 yards east, south, and southwest of Shepherd Reef.

Gull Island, small, round, partially wooded, and 23 feet high, lies nearly 1 mile north-northwest from Sulphur Island, and its eastern side is steep-to.

Sam Smith Rock, with 11 feet over it, lies 1,175 yards west from Gull Island.

Thessalon Island is situated $3\frac{1}{2}$ miles southwest by west from the mainland point of that name. It is thickly wooded, nearly $1\frac{1}{4}$ miles in length, in a west-northwest direction, and is fringed by shoal water on all sides. On its northeast side isolated rocks with a depth of 12 to 13 feet over them prevent a nearer approach than 590 yards, while from its northern coast shallow water extends 300 yards. Its western coast, including the detached island, may be approached to 200 yards.

Kangaroo Rock, 7 feet high, consisting of a few blocks of stone, lies 590 yards southward from the southwest point of Thessalon Island. Its west and south sides are fairly steep-to, being approachable to 200 yards. A reef extends 300 yards from its eastern side and a detached rock with 4 feet over it lies 200 yards northeastward from it, while from this detached rock a bank with 12 feet on it runs to the southwest point of the island. Between the spit extending 200 yards from the latter and the 4-foot rock there is a passage for a light-draft vessel. Eastward of Kangaroo Rock the coast of Thessalon Island should not be approached nearer than 440 yards.

Koshkawong (Milford Haven) is a well-sheltered harbor on the eastern side of St. Joseph Island, and Pecks Point, the northeast entrance point of the haven, mark the southern limit of the Canadian survey of this coast, as does a line drawn from Beef Island to Chippewa Point. On the northeast shore of the haven and a little less than 590 yards from Pecks Point, is a sawmill (shut down in 1914) and a wharf in poor condition.

Perrique Island is a narrow collection of stones and gravel with a few trees on it, 250 yards long north and south, situated north-

west by north $3\frac{1}{4}$ miles from Chippewa Point. A spit with 9 feet on it makes off from the north point 250 yards, and a reef with less than 6 feet on it extends 440 yards from its south point; the eastern sides of Perrique Island and the south reef are steep-to. The mark for clearing the south end of Colville Bank leads also south of the shoal water from Perrique Island.

O'Donnell Island, 20 feet high, is the southern and larger of the two which lie westward of Perrique Island; it is the highest island in this vicinity, is partly cleared, and its south and west sides may be approached to 200 yards.

Colville Island, nearly 440 yards north-northeast from O'Donnell Island, is the same length north and south and is joined to O'Donnell Island by shallow water. A rock with 15 feet water on it lies northwest by north 590 yards from the north point of Colville Island and nearly in the middle of the passage, but the depth on the rock is not likely to affect the few vessels using the passage.

Colville Bank is an extensive patch with less than 6 feet on it in places, commencing on the east side of Colville Island and gradually curving southward, leaving, however, a passage 250 yards broad, with a depth of 4 fathoms between it and Perrique Island. The total length of this bank is nearly 1 mile and its south end may be cleared by keeping the south points of Beef and O'Donnell Islands in range, bearing 290° (NW. by W. $\frac{1}{4}$ W.).

Beef Island is joined to the next mentioned by a shallow sand bar with about 1 foot water over it. A shoal spit makes off from its north point 200 yards, and a reef with 3 feet water on it lies north-northwest 440 yards from the same extremity, leaving a narrow passage between it and the island, through which 14 feet was carried by keeping on the ice-house range below mentioned. The west and southeast sides of Beef Island may be approached to 150 yards.

Wallace Island is the largest of the group, being separated from Emily Island by a narrow channel, through which 3 fathoms can be carried by keeping the ice house on the Koshkawong Point touching Pecks Point, bearing 208° (SSW. $\frac{1}{4}$ W.). A flat makes off from the north point of Wallace Island 440 yards, but its eastern side may be approached to half that distance.

Emily Island is the smallest of those which front Richmond Bay and the shore between it and Koshkawong Harbor. Its east coast may be approached to 300 yards, but is almost joined to Richmond Point by a reef of dry stones.

Lyon Cove is the first small bay north of Pecks Point, and between it and Beef Island good anchorage may be had in 3 fathoms mud bottom. Anchorage may also be had under the west side of Wallace Island in the same depth and bottom by entering between Emily and Wallace Islands on the range already given.

Richmond Bay is the broad but shallow indentation westward of the point of that name distant 2 miles northward from Pecks Point.

Caradoc Point is the next projection, 1 mile northeastward of Richmond Point. Detached stones lie 50 to 70 yards off Caradoc Point, but the deep water comes sufficiently near to allow the point to be approached to 150 yards.

Fox Island, about 10 feet high and wooded, situated 1,320 yards eastward of Caradoc Point, is a little over 440 yards long north and south and 200 yards broad. Its east side may be approached to 200 yards, but from its other sides shoal water extends a greater distance.

Ironsides Reef extends 1,175 yards northward from the north point of Fox Island. It has an average breadth of 300 yards and is composed of a few large boulders 1 to 2 feet above water and several with very little water over them. The north end of this reef may be avoided by keeping the north points of Gull and Serpent Islands in range, bearing 107° (ESE. $\frac{1}{2}$ E.).

West Rock, with 7 feet water over it, lies west-northwest, 350 yards from the inside sandy point of Fox Island, and the ice-house range before mentioned leads 200 yards west of it.

South Bank extends a little more than 440 yards southward from the south point of Fox Island, the outer part having only 2 feet water over it. Between West Rock and South Bank shoal water extends from the island 200 yards. The south shore of Mosquito Bay in range with Caradoc Point, bearing 329° (NNW. $\frac{1}{2}$ W.), leads clear of South Bank.

Mosquito Bay is a shallow boat harbor situated northward of Caradoc Point, the northern shore having shallow rocks lying 440 yards off it.

Big Point may be considered the south entrance point of St. Joseph Channel from the east, and, with the exception of a flat extending 200 yards off, is clean. Its southeastern extremity is distant nearly $2\frac{1}{4}$ miles north-northeast from Caradoc Point, and the land close back of the point is high and wooded.

Recollet Point is situated 2 miles west-northwest from Big Point, the indentation between them named Moffat Bay having good anchorage in 4 to 6 fathoms, clay bottom.

Old Quarry Point.—The coast from Recollet Point trends north-westward $1\frac{1}{4}$ miles, and eastward 880 yards to the above point, forming a bay from the shore of which shoals extend an average distance of 590 yards.

Gravel Point, situated 3.6 miles northwest from Big Point, is high and wooded, and derives its name from its high gravelly beach. The water close to it is deep.

St. Joseph Channel is the water separating St. Joseph Island from the mainland of the district of Algoma; and, from Bruce Mines on the east to Sugar Island of the United States on the west, is $17\frac{1}{4}$ miles in length. The eastern entrance between Bruce Mines and Big Point is broad and the channel keeps wide for 7 miles to Sister Rocks. Hence to Bamford Island ($4\frac{1}{4}$ miles farther) the channel is narrowed by islands, being only 100 yards wide at Wilson Channel the name given to the passage nearer Sugar Island than Bruce Mines.

From Bamford Island to Shoal Island Lighthouse, near $4\frac{1}{4}$ miles, the channel from shore to shore (called by some Bear Lake) is broader, but the shoals from the north shore limit the width of the navigable passage considerably. After passing the narrows at Shoal Island Lighthouse, the channel again widens for $1\frac{1}{4}$ miles to the dredged and buoyed channel between St. Joseph and Sugar Islands.

The two places requiring the greatest care in navigating St. Joseph Channel, are the vicinities of Bamford and Shoal Islands on account of the sunken rocks (usually buoyed) and strong current.

A stranger should not attempt St. Joseph Channel at night, but will have no difficulty (when the buoys are in position) in navigating in daylight, by following the directions herein given, which will lead him not over less than 15 feet at low stages of the water.

A vessel from Lake Superior bound to the southeastern ports of Georgian Bay, by using St. Joseph Channel and North Channel of Lake Huron, would have comparatively smooth water from Sault Ste. Marie to Badgeley Island, before emerging into the open waters of Georgian Bay, adding considerably to the comfort of passengers in the autumn without a great increase of distance.

In treating of St. Joseph Channel, it will be divided into three portions, Gravel Point to the Sisters, the Sisters to Bamford Island, and the latter to St. Mary River.

Ten Rib Rock, with 1 foot over it, lies nearly 880 yards west by south from One Tree Island, and a patch with 10 feet on it lies 440 yards westward from Ten Rib Rock.

Beer Rock, with 10 feet on it, is situated 1.1 miles westward from One Tree Island. If approaching Portlock Harbor from the southeast, Woodman Point, in range with the west side of the northeast Piercy Rock, bearing 327° (NNW. $\frac{1}{4}$ W.), will lead between Beer and Ten Rib Rocks in good water.

Piercy Rocks consist of five islets, the highest of which is 11 feet above the water; they lie $1\frac{1}{4}$ miles west-northwest of One Tree Island and mark the southeast and main channel into Portlock Harbor.

Hannah Ground is several rocky patches lying 1,175 yards southwestward of Piercy Rocks, the least water on them being 13 feet.

Plummer Island is the largest of a group separated from Portlock Island by a channel through which there is a passage for a light-draft vessel.

Plummer Bank, with 9 feet least water on it, lies with this, its shoalest place, 590 yards southwestward of Plummer Island and 1,320 yards southeastward from West Sister Rock Lighthouse. The bank may be crossed with 18 feet by keeping the summit of Walker Island in range with the present outer end of the lighthouse landing jetty, bearing 335° (N. by W. $\frac{1}{4}$ W.).

Buoys.—A red and a black spar buoy mark, respectively, the east and west sides of the 18-foot passage over the western end of Plummer Bank. In 1914, the beacon not being discernible, a steamer drawing 13½ feet passed between the red spar and the black spar buoys, with the jetty in line with the stone hut on the summit of Boswell Island, bearing 339° (N. by W. $\frac{1}{4}$ W.).

Caution.—The bottom in this locality being very lumpy, a vessel should slow down and keep the lead going.

The Sisters consist of four small rocks lying between the eastern extremity of Campement d'Ours and Portlock Islands. South Sister, 1 foot high, is quite bare and joined to the former by shoal water; East Sister, 4 feet high, has a bush on it; North Sister has the wooden foundation of the old lighthouse; and West Sister is occupied by the present lighthouse.

West Sister Rock Light, fixed white, 35 feet above water, visible 11 miles, is shown from a white hexagonal wooden structure on the rock.

Fog signal.—The fog signal is made on a hand horn, which answers vessels' signals.

Although there is a passage on either side of the lighthouse, the better lead is southwest of it and between it and South Sister.

Hilton.—From Gravel Point the coast of St. Joseph Island trends a little southward of west 2½ miles to Hilton (Marksville). Its district had in 1911 a population of 378. It has a post office under the latter name and frequent steamboat connection with Sault Ste. Marie, Owen Sound, Collingwood, and intervening ports. The nearest customs port of entry is Bruce Mines. The land in the neighborhood is reported fertile. Distant about 150 yards southeast of the wharf is a sawmill in active operation (1914).

Wharf.—An L-shaped concrete wharf in good condition extends 250 feet from the shore, and thence 200 feet southeastward, affording shelter to vessels drawing less than 10 feet. On the outer front of the wharf the depth at a low stage of the water is 18 feet, but on the northwest side 100 feet from the outer end the depth is but 10 feet.

Note.—In 1914, for the protection of small tugs and motor boats, a basin was dredged between the Government wharf at Hilton and the lumber wharf just east of it. The dredged area is about 180 square feet and has a depth of 10 feet below 580 feet above mean tide, New York.

Light.—A fixed red light is shown from shed at end of wharf.

Fisher Shoal, with less than 6 feet water on it, lies 440 yards northwest from the shore of the bay of that name and over 1,320 yards east of Hilton Wharf.

The thickly wooded shore runs northwest by north $3\frac{1}{4}$ miles from Hilton to Canoe Point, the southeast entrance point of Desjardins Bay, the name given to the eastern half of the boat channel dividing Campement d'Ours from St. Joseph Island. A vessel will find good water close to the above shore.

Portlock Harbor is the water almost hidden to a vessel proceeding through St. Joseph Channel by Portlock and Dawson Islands, separated from each other by a narrow boat channel. Vessels of light draft can enter Portlock Harbor from the west by passing north of Dawson Island, but the main channel is northeastward of Piercy Rocks and Colby Island. By this passage a vessel can carry in 18 feet (at low stages there may be $2\frac{1}{4}$ feet less), and can make fast to the northeast side of Belford Island, nearly 1 mile from Piercy Rocks, or anchor in 4 fathoms between that island and Dunlevie Point.

A vessel drawing 14 feet can proceed as far as Wurtele Point of Dawson Island by passing between Pine Rock and Dunlevie Point and on either side of Hat Island, but as the channel between the banks is narrow, she should proceed slowly and keep the lead going. There is no village at Portlock Harbor (1890), but vessels occasionally proceed thither to load pulp wood. The Sault Branch of the Canadian Pacific Railroad passing within 440 yards of the northern shore, together with the possibility of the discovery of minerals, may some future day enable so snug a harbor to be resorted to more than it is at present.

Directions to Portlock Anchorage.—If from the east, when approaching Gravel Point, look out for the entrance to the harbor, $1\frac{1}{4}$ miles westward of One Tree Island, and when Woodman Point, the east entrance point, touches the west side of the northeastern Piercy Rock, bearing 327° (NNW. $\frac{1}{2}$ W.), keep them so ahead, which range will lead between the shoals. Pass 40 or 50 yards northeastward of the Piercy Rock Group (these two small ones are steep-to), and proceed in mid channel to Belford Island, or anchor as before directed.

Approaching Portlock Anchorage from the west: From the intersection of the Walker and Birch Island leading marks steer for

Piercy Rocks, bearing 73° (ENE. $\frac{1}{2}$ E.). Pass 50 yards south and northeast of them, and thence as before directed.

Carmona Rock, with 10 feet on it (in low stages there may be $2\frac{1}{2}$ feet less), is an awkward obstruction lying 440 yards north by west, from West Sister Lighthouse.

Buoy.—Carmona Rock is marked by a red and black horizontally striped spar buoy as a middle ground, but the track used is westward of the buoy, and between it and the 13-foot rock westward of Carmona Rock.

A rock with 13 feet over it lies over 590 yards northwest from West Sister Lighthouse and 350 yards west by north from Carmona Rock.

Campement d'Ours Island is $1\frac{1}{2}$ miles in diameter and is separated from St. Joseph Island by a channel which in 1914 was almost dry.

Agate Island, 44 feet high, lies 300 yards off the northeast side of Campement d'Ours Island and is 1,175 yards northwestward from West Sister Lighthouse. The ship's track is close to the east and north sides of this channel on account of a rock with 7 feet water over it lying 300 yards northeast by east from the north point of Agate Island.

Graveyard Point is made prominent by a low neck joining it to the higher land of Campement d'Ours Island; it should receive a berth of 100 yards on account of a rock which lies 50 yards from its northwestern extremity. The remainder of Campement d'Ours Island westward of Graveyard Point is bold.

Just westward of Graveyard Point the owner of the island has a large, conspicuous residence (1890).

A string of small, bare islands lie on the north side of the track, extending from the west side of Portlock Island to abreast of Graveyard Point, the nearest one to the track being Jermyn Rock, 17 feet high, lying nearly 440 yards northwest by north from the north point of Agate Island.

Boswell Island, the middle one, 25 feet high and highest of the string, is situated nearly 590 yards north-northeast from the same, and deserves mention as being a back leading mark for crossing Plummer Bank.

Walker Island, 79 feet high at its eastern end, though not near the ship's track, is of importance as having a prominent summit, used as part of a leading mark for passing Plummer Bank. A vessel will find good anchorage in 4 to 6 fathoms, clay, 440 yards southeastward of Walker Island.

Beacon.—A beacon is located on the summit of the eastern end of the island.

Picture Island, 67 feet high, is on the south side of the channel and is the next large island westward of Campement d'Ours Island. It derives its name from a couple of white patches resembling an Indian and squaw with snowshoes over their shoulders (1889); its northern side is steep-to.

Walker (Desbarats) River is situated on the mainland side of St. Joseph Channel, its mouth lying 2.3 miles 344° (N. by W. $\frac{1}{8}$ W.) from West Sister Rock Lighthouse. From the mouth a channel with depth of 5 feet at 579 feet above mean level at New York has been dredged 640 feet in a 210° (SW. by S.) direction, and then 1,300 feet 169° (S. $\frac{1}{8}$ E.), and is marked by three red-spar and three black-spar buoys.

Desbarats Canadian Pacific Railroad station is situated about $1\frac{1}{2}$ miles upstream, and from which passengers and freight are conveyed to points on St. Joseph Island.

Desbarats—Wharf.—Kensington Point, on the north shore, is situated midway between Walker Island and Killaly Point, and on it is a wharf for the convenience of local steamers, as the locality known as Desbarats is a considerable summer resort.

Killaly Point, 80 feet high, is on the north or mainland shore, opposite Picture Island, the passage here being 200 yards broad, with as much as 34 fathoms of water in one place. The southeastern extremity of Killaly Point is low and grassy, but the middle portion is steep, with broken stones on its slope.

For nearly 1 mile westward of Picture Island the channel is bounded on the south by a string of islands with narrow gaps between them, the most remarkable of which is Devils Gap, between Copper and Devil Islands; vessels formerly passed through this gap, but on account of a rock with 9 feet of water on it lying in the middle of its narrow channel, it has been abandoned.

Wilson Channel.—This passage is between Wilson Island and the steep, cliffy mainland shore; 5 fathoms may be carried through.

Range lights—Front light.—A fixed white light, 58 feet above water, visible 3 miles, is shown from a white square wooden structure on the mainland opposite the northwest point of Wilson Island.

Rear light.—A fixed white light, 109 feet above water, visible 3 miles, is shown from a white, square wooden structure 243 yards 53° (NE. by E.) from the front light. These in range astern lead between the shoals to Richards Landing.

Wilson Island crib.—A reef extends 100 yards westward from the northwest end of Wilson Island, and the greater portion has been covered up by a crib, on the north side of which a vessel may make fast if overtaken by darkness. About 30 yards of the reef projects beyond the cribwork.

Buoy.—The projection of the reef beyond the crib is marked by a black spar buoy.

Reef.—From a point on the main shore, situated 350 yards westward of the front range light, a reef extends 100 yards.

Beacon.—A beacon stands on the reef.

Buoy.—A red spar buoy marks the southern end of the reef.

A rock with 15 feet water on it lies 80 yards west-northwest from the end of Wilson Island crib, and as at low stages there may be $2\frac{1}{2}$ feet less water, it is avoided by keeping close to the black spar buoy off Wilson Island crib.

Bamford Island, 16 feet high, is the southeastern small islet of a group on the northwest side of the passage and is situated 1,175 yards southwest by west from Wilson Channel front range light. The unlighted tower was standing in 1914. A reef extends from the south point of Bamford Island in a south by west direction 200 yards where the depth is 18 feet, and a reef extends 150 yards in the same direction from the south point of the island next west of Bamford Island, where the depth is 15 feet.

Buoy.—The reef extending from the south point of Bamford Island is marked by a red spar buoy.

Two rocks with 2 feet and 3 feet water on them lie, respectively, southeast by east 150 yards, and east 300 yards from Bamford Island.

Buoys.—The rock with 2 feet on it is marked by a black spar buoy with a red spar buoy abreast it.

NOTE.—The depths given for Wilson Channel were taken in 1889; at low stages there may be $2\frac{1}{2}$ feet less.

Port Finlay is the name given to the wharf on the mainland situated 1.1 miles westward of Bamford Island, but as it is beset by shoals no master of a vessel should approach it without local knowledge.

Buoy.—A red spar buoy is moored just eastward from Port Findlay Wharf.

Chicora Shoal is the southernmost of the many dangers lying off Port Finlay, its shoalest part with 6 feet water on it lying a little over 1,175 yards northeastward from Richards Landing.

Buoys.—Chicora Shoal is marked by two red spar buoys.

Humbug Point, on St. Joseph Island, is situated over 590 yards southward of Bamford Island. It is high and partially wooded.

McKinnon Rock, with 9 feet water on it, lies over 590 yards west by south from Humbug Point and 200 yards southeastward of the line of Wilson Channel range lights.

Rosseau Island, about 20 feet high and partly wooded, is situated nearly midway between Humbug Point and Richards Landing and is separated from the coast of St. Joseph Island by a shallow boat channel.

Rosseau Shoal, with 2 feet water on it, lies 250 yards northward of Rosseau Island and 300 yards southeastward of the line of the range lights.

Richards Landing is the small village and wharf on St. Joseph Island, situated in the southern part of the portion of the channel called Bear Lake; there is frequent steamboat connection with Sault Ste. Marie, Owen Sound, Collingwood, and the ports between. There is a depth of 18 feet at the wharf, the immediate approach to which is free from danger.

Light.—A fixed white light, 16 feet above water, visible 3 miles, is shown from a lantern on a warehouse on the wharf at Richards Landing.

Coast.—The coast of St. Joseph Island from Richards Landing to Shoal Island takes the shape of a large bay, off the shore of which a flat under the depth of 18 feet extends an average distance of 880 yards.

Leonard Reef, 3 feet high, composed of bowlders with a few bushes growing between them, is situated in the northwestern portion of this bay, and 590 yards southeastward from Shoal Island.

Shoal Island is separated from Boulanger Point of St. Joseph Island by a channel 200 yards broad, through which it is possible to carry 13 feet water, but on account of the sunken rocks in it and the better passage northeastward of Shoal Island it is not to be recommended. Shoal Island 200 yards from its northwestern extremity is divided by a narrow gut.

Rocks dry and sunken extend nearly 100 yards off the northeast side of Shoal Island, and close to them the water is deep.

Light.—A fixed white light, 32 feet above water, visible 4 miles, is shown from a white, square dwelling on the north end of Shoal Island.

Fog signal.—The fog signal is made on a hand horn, which answers vessels' signals.

A rock with 12 feet water over it (at low stages there may be $2\frac{1}{2}$ feet less) lies 70 yards north from the lighthouse, the ship's track passing between them.

Horse Island, 42 feet high, is the southern large island of the group lying northward of Shoal Island Lighthouse and almost filling the mouth of the extensive shallow bight known at Maskinonge Bay. Horse Island is nearly $2\frac{1}{4}$ miles westward of Port Finlay, the intervening shore being fronted by numerous dry stones and sunken rocks.

Rock.—A rock with 7 feet on it lies 150 yards south by west from the south point of Horse Island.

A rock with 15 feet of water over it lies 168° (S. $\frac{1}{4}$ E.), 400 yards from the south point of Horse Island.

Buoy.—A red conical buoy marks the rock with 15 feet on it.

Wabuno Bank is a dangerous rocky ledge, with depths on it varying from a few inches to 9 feet, lying 200 yards northward of Shoal Island Lighthouse.

Empire Ledge, with 1 foot water on its shoalest part, is situated with its southeastern extremity almost joining Wabuno Bank, and northeastward of the ship's track. These two ledges, together with the 12-foot spot mentioned above off the lighthouse, render this portion of St. Joseph Channel the most difficult to navigate, made worse by the strong current out of St. Mary River.

Buoy.—A red spar buoy marks the southern edge of Empire Ledge.

Stribling Point.—From Boulanger Point the coast of the northwestern extremity of St. Joseph Island trends in a general westerly direction 1.6 miles to Stribling Point, when it abruptly turns southward forming the eastern shore of Little Mud Lake, St. Mary River. (See Ch. XII.)

Cambria Bank, with 10 feet water on it (at low stages there may be $2\frac{1}{2}$ feet less), extends a little more than 590 yards northward from the coast 880 yards eastward of Stribling Point.

Light buoy.—A black cylindrical buoy, showing an occulting white light, is moored in 24 feet about 700 yards northeastward of Harwood Point, Sugar Island.

Buoys.—A red conical buoy is moored 440 yards west-northwest from Stribling Point front range light, and a red spar buoy lies between it and Cambria Bank Buoy above mentioned. Running between St. Joseph Channel and St. Mary River, vessels must pass northwest of these two red buoys.

Harwood Point is the southeastern extremity of Sugar Island (United States), 880 yards from Stribling Point, and between them the buoyed channel has been dredged to a depth of $13\frac{1}{2}$ feet at 579 feet above mean tide at New York. (For description of range lights see Chapter XIX.)

East Neebish Island, 2 miles long in a northwest direction, belongs to Canada, and is situated 440 yards eastward of the southern part of Sugar Island, the portion of St. Mary River between them being known as East Neebish Channel.

The northern coast of East Neebish Island is divided from the mainland of Canada by a shallow boat channel, while eastward from the island runs in a long bay from St. Joseph Channel, affording in its southern part excellent anchorage in 16 to 18 feet clay bottom. The bay is separated from Maskinonge Bay by a narrow peninsula appropriately called Long Point.

Rain's wharf and barns are situated on the east coast of Sugar Island nearly 1 mile northward of Harwood Point, and are used as

a leading mark. The United States Government has a lighthouse depot here.

Buoys.—A black and red horizontally striped buoy lies on the Harwood Point Range and opposite the red conical buoy above mentioned; vessels pass between them when bound to or from St. Joseph Channel. A black spar buoy is moored a little over 880 yards eastward from Harwood Point front range light. All vessels pass southeast of this buoy.

Hen and Chickens Range Lights—Front light.—A fixed red light, 32 feet above water, is shown from a white post on the east shore of Neebish Island.

Rear Light.—A fixed red light, 32 feet above water, is shown from a post 566 yards 231° (SW. $\frac{1}{4}$ W.) from the front light. A white diamond-shaped daymark is attached to each post. These in range lead through the channel connecting Collingwood Channel and Little Mud Lake.

Bekwabekung (Thorn) Island, in three parts (the eastern and largest of which is 65 feet high), lies in the bight formed under the southern portion of East Neebish Island; East Neebish Channel runs between Bekwabekung and Sugar Islands.

Atlantic Rock, with 6 feet water on it, is an isolated spot situated 590 yards south-southeast from Bekwabekung Island.

Merida Shoal, with less than 6 feet water over it, lies 350 yards south by west from Bekwabekung Island and about the same distance northwest of Atlantic Rock.

Buoy.—A red spar buoy marks Merida Shoal.

Anchorage.—A vessel having to anchor will find a good berth between Bekwabekung and the western of the two islands forming the southern extremity of East Neebish Island in 3 to 4 fathoms mud, taking care to avoid Merida Shoal and Atlantic Rock, which she should pass eastward of.

Directions for St. Joseph Channel.—Between Cedar Island and Canoe Point of St. Joseph Island, 10 miles from each other, the coast of the latter is steep to, in marked contrast to that of the mainland, and a vessel proceeding right through St. Joseph Channel should not approach the mainland shore nearer than the line of the south point of Birch Island touching the north points of Calf and Cedar Islands, bearing 105° (ESE. $\frac{1}{4}$ E.).

Proceeding northwestward, when the outer end of the landing jetty at West Sister Lighthouse comes in range with the beacon on the summit on the east end of Walker Island, bearing 335° (N. by W. $\frac{1}{8}$ W.), or the lighthouse itself is in range with the top (marked by a small stone hut in 1914) of Boswell Island, bearing 339° (N. by W. $\frac{1}{4}$ W.), either range may be kept, and Plummer Bank crossed between the red

spar and the black spar buoy. As a deep draft vessel will not have much water to spare, she should proceed slowly and keep the lead going here.

Continue on between South Sister and West Sister Lighthouse, passing southwest of Carmona Rock striped buoy, close northeast of Agate Island, when the southern shore of the channel must be kept fairly close on board until the narrows of Wilson Channel are reached. Pass now between the black spar and the red spar buoy, bringing the two range lights on the bluff in range astern, bearing 53° (NE. by E.), and Richards Landing a very little on the starboard bow, which will lead southeast of the two red spar buoys marking the reefs from Bamford Island, and northwest of the black spar buoy marking the southwestern of the two isolated shallow patches. A vessel of heavy draft should slow down here also.

Proceed on the lighthouse range, which leads southeast of the two red spar buoys marking Chicora Shoal; passing which a vessel should haul gradually westward to bring Shoal Island Lighthouse ahead, and Richards Landing astern. The former should be seen in range with Rains Barn near the Lighthouse Depot on Sugar Island, bearing 304° (NW. $\frac{1}{2}$ W.), and this track should lead southwest of the red conical buoy moored southward of Horse Island.

Haul carefully and slowly round Shoal Island Light, passing between the black spar and the red spar buoy marking the narrow and awkward turn in the channel, in which the current is strong. Now keep westward for 200 yards, and then steer 303° (NW. $\frac{1}{4}$ W.), with the Lighthouse Depot about half a point on the starboard, and Cambria Bank black light buoy a little on the port bow, passing southwest of Empire Ledge red spar buoy.

CHAPTER XII.

NORTH CHANNEL—FROM MELDRUM AND SICCORDE POINTS TO CLAPPERTON AND McBEAN CHANNELS.

The low water of 1895 (579 feet above mean tide at New York) was $3\frac{1}{2}$ feet below the datum used for this chapter.

Plan.—The plan of this chapter is to describe the southern shore from Meldrum Point eastward to Clapperton Channel and the northern shore from McBean Channel westward to Siccorde Point.

Meldrum Point, a little over 1 mile west of Brittomart Point (next described), is the gradually rounding northwestern extremity of Manitoulin Island. It may be considered also the east entrance point from North Channel to Mississagi Strait, being distant from the lighthouse of that name by the coast line 6 miles. The point is backed at a distance of 300 yards by a cliff about 200 feet high, mostly obscured by trees. A fringe of shoal water extends 150 yards from the western part of Meldrum Point, which therefore should not be hugged too closely by a heavy-draft vessel from Lake Huron.

Brittomart Point.—This, the west entrance point of Meldrum Bay, has a spit extending from it 150 yards, and a large bank under the depth of 10 fathoms reaching 2 miles east and over 1 mile north-westward of it, the shoalest part with 4 fathoms on it taking the name of Danville Ground and lying 1,320 yards 329° (NNW. $\frac{3}{4}$ W.) from Brittomart Point.

Meldrum Bay is the westernmost indentation on the north coast of Manitoulin Island. The bay is contained between Chamberlain and Brittomart Points nearly 4 miles apart, and from the line of these points to Muriel Point is nearly 3 miles long, with a breadth at the bottom of $1\frac{1}{4}$ miles. The land 590 yards back from the east and west shores is about 200 feet in height, the limestone cliffs occasionally showing through the partially burnt timber. The bay affords excellent shelter in westerly gales. A vessel may anchor in 10 fathoms in the southwest corner of the bay, or in 5 fathoms 300 yards southward of the wharf, keeping Mississagi Island Light in sight.

This wharf and sawmill, at which steamers running from the southeastern ports of Georgian Bay to Sault Ste. Marie call occasionally in the summer, is situated on the west shore of the bay and nearly 1 mile from the bottom. In winter mail communication is

had with the east by carrier to Gore Bay. There is a depth of 24 feet at the wharf.

Chamberlain Point is the east entrance point of Meldrum Bay, and from it a ledge with 10 feet on it extends in a northeast direction 440 yards. Eastward 1,320 yards from Chamberlain Point the bank joins that connecting Vidal and Batture Islands, and with the assistance of a couple of buoys placed on this ridge it is possible that 15 or 16 feet might be carried between Vidal and Meldrum Bays. The steamer *Bayfield* in the year 1888 crossed the ridge from Vidal Bay on two ranges with 12 feet least water by keeping a conspicuous little fall in the land on the southeast shore of Vidal Bay open its height of the west shore of the same bay, bearing about 122° (SE. $\frac{1}{4}$ E.), until Cape Robert came halfway between Vidal and Crescent Islands, bearing about 80° (E. $\frac{1}{2}$ N.), which mark was kept on astern.

Whitly Point.—From Chamberlain Point the east shore of Meldrum Bay trends 2.6 miles southwestward, with three slight indentations, to Whitly Point; and for $1\frac{1}{2}$ miles from Chamberlain Point it should receive a berth of 300 yards; the remainder may be approached to half that distance.

Muriel Point, at the bottom of Meldrum Bay, divides it into two large coves, the southeast one, between it and Whitly Point, being known as Newbery, the western one named Macrae Cove.

Welch Island, in Newbery Cove, small and wooded, lies 120 yards offshore and nearly 880 yards east-southeast of Muriel Point, and midway between the island and Whitly Point is a rocky bank with less than 6 feet water over it. A vessel should not pass inside or southward of the line joining these points.

Macrae Cove is deeper, and the bottom may be approached to within 300 yards. A snug but shallow little boat harbor is situated on the west shore of this cove and 880 yards southward of the mill. A vessel may drop her anchor between this boat harbor and Muriel Point in 10 fathoms over mud.

Wharf.—Near the mill is built a wharf for the piling and shipping of lumber, with sufficient water alongside for the largest vessels, but in approaching it from the north care must be taken to avoid a gravel bank with 12 feet water on it, the outer end of which lies 250 yards northeast by east from the northeast angle of the wharf. There is slightly deeper water inside this bank. From the wharf the west shore of Meldrum runs north 1,175 yards, gradually inclining westward, with good water 150 yards off.

Batture Island, 5 feet high and wooded, is 300 yards long east and west and 70 yards broad and marks the western termination of the barrier reef joining it to West Point of Vidal Island, from which it is distant $2\frac{3}{4}$ miles. On the north side of the island the water is good and may be approached to 200 yards, but from the western end

a reef extends in a southwesterly direction 880 yards, where there is 15 feet. At 440 yards from the same there is less than 6 feet; care must therefore be taken to avoid it in entering Meldrum Bay from the east.

On the north side of the continuous reef joining Vidal and Batture Islands there are two distinct patches, the western one, with 14 feet over it, being $1\frac{1}{2}$ miles 296° (NW. by W. $\frac{1}{4}$ W.), the other, with 9 feet on it, being 1,175 yards 309° (NW. $\frac{1}{8}$ W.) from West Point of Vidal Island. Meldrum Point open well northward of Batture Island, the latter bearing 257° (W. $\frac{3}{4}$ S.), leads northward of these patches. In thick weather a vessel should not shoal the water to less than 10 fathoms between Crescent and Batture Islands.

From Chamberlain Point the unbroken west shore of Vidal Bay runs northward 1.3 miles and then west-northwest $2\frac{3}{4}$ miles to Chamberlain Point, to within 1 mile of which the shore may be approached to 100 yards.

Vidal Island is 2.1 miles long east and west, 1,320 yards wide near its east end and about 20 feet high on the north side, gradually sloping to the south shore, and thinly wooded.

Arthur Point, its most easterly projection, should not be approached nearer than 300 yards. The coast from the point trends northwestward straight for 1,320 yards to the most northerly point of the island, with good water, excepting the last 300 yards.

Harold Point, the most southerly portion of Vidal Island, is situated 880 yards southwestward of Arthur Point, and is important because of a shallow bank extending southeastward from it nearly 1,320 yards.

The north end of a patch with 6 feet on it lies nearly 880 yards east-southeast from Harold Point and a little more than that distance south from Arthur Point. A patch with 16 feet least water on it lies nearly 1,320 yards 147° (SSE. $\frac{1}{2}$ E.) from Harold Point, and a bank 440 yards long north and south is situated with its shoalest spot near the south end with 13 feet upon it on the same bearing and 1.1 miles from Harold Point.

Clearing mark.—To lead northwest of the latter bank, keep the northwest extremities of Bayard and Morris Islands in range bearing 61° (NE. by E. $\frac{3}{4}$ E.), but this mark leads over the 16-foot patch.

The south coast of Vidal Island, low, shallow, and strewn with dry stones, trends westward $1\frac{1}{2}$ miles from Harold Point, and should not be approached nearer than 880 yards by a vessel drawing 12 feet.

West Point.—This western extremity of the island is foul and joined to Batture Island by a barrier reef over which there is no passage for a vessel. Shallow water extends 440 yards northward of the point and the western 880 yards of the island. A very snug little boat harbor exists 440 yards eastward of West Point, and between it

and the northern extremity of Vidal Island distant 1.3 miles there are two bays, in the western of which the deep water approaches close to the shore. In the eastern bay a reef of dry stones extends 200 yards in a northeasterly direction from its west point. A patch with 12 feet on it lies 300 yards north by east from the latter.

Crescent Island, about 3 feet high, consists of three distinct islands joined by stones; the southern is much the largest, and the timber on it is left in thick clumps with coarse grass growing on the gravel between. The island has still something of a crescent shape with the convex side facing northnorthwest, and it is quite possible that the resemblance was greater when named. This island is connected with the northern extremity of Vidal Island by a ridge, over which not more than 10 feet can be carried.

A bank extends over 590 yards west by south from the western extremity of Crescent Island, at which distance there is 11 feet. Shoal water follows the round west side of the island to 440 yards westward of the northern islet, on the north side of which, however, the water is deep. Thence eastward the shoal water gradually spreads farther out, only 12 feet being found 440 yards eastward of the south gravelly point of Crescent Island.

Vidal Bay is a long and broad indentation, the eastern side of which trends from Morris Island in a general southwest direction 4 miles to the bottom, where there is excellent anchorage and shelter in 5 to 6 fathoms. Vidal Island lies across the mouth of the bay, having a channel 1.3 miles wide eastward of it, through which $3\frac{1}{2}$ fathoms might be carried if buoyed. In the absence of buoys 16 feet (in low stages there may be $3\frac{1}{2}$ feet less) can be carried in by attending to the directions previously given.

A depth of 12 feet may be carried southward of Vidal and Bature Islands and the reefs joining them, but as this channel is crooked and no intelligible leading marks could be found it should not be attempted by a stranger. Good anchorage in 4 fathoms over sand and clay will be found 1,175 yards off the middle of the south coast of Vidal Island.

The land around the shores of Vidal Bay is wooded and rises to a height of 150 feet 440 yards back from it.

Masson Island, small and low, lies 1 mile southwest from Morris Island, the shore between being fronted by scattered dry stones. For 880 yards northeast of Masson Island a bank extends from the shore 880 yards, a depth of only 5 feet being found 440 yards west of the island, while the north tongue of the bank with 12 feet on it is situated nearly 880 yards north-northwest from the same.

Clearing mark.—The northwestern extremity of Bayard Island open north of or touching the same side of Morris Island, bearing 61° (NE. by E. $\frac{1}{2}$ E.), leads clear of this bank.

Morris Island, low, wooded, $\frac{1}{4}$ mile long north-northeast and south-southwest, with its long narrow south point 100 yards from the main shore, lies 1 mile westward from Laphorn Island, and affords good shelter to the little boat cove south of it.

The western portion of the coast between Laphorn and Morris Islands is foul for 590 yards. The land at the back of the island is wooded and about 200 feet high, lessening its height as Cape Robert is approached; the west side of Morris Island can be approached to 200 yards.

Creasor Bight.—From Masson Island the shore of Vidal Bay runs south-southeasterly 1,320 yards, forming a shallow bay, the southern part of which is sandy, called Creasor Bight, where not more than 15 feet will be found nearly 880 yards from the shore. The coast now trends west-southwestward 2 miles and southwestward 1,175 yards to the eastern and deeper of two coves at the bottom of the bay, where a stream empties itself; this shore may be approached to 200 yards.

Laphorn Island, in two parts, lies southwestward 590 yards from Bayard Island, leaving a boat passage between it and Manitoulin Island; the western side may be approached to 200 yards.

Bayard Island, the ground of which is only 5 feet high, although the timber on it makes it appear much higher, is situated $1\frac{1}{4}$ miles from Eaton Point; it is 590 yards long northwest and southeast by 250 yards broad in the middle and is connected to the west point of Cole Bay as well as to Laphorn Island by a shallow bank, affording a passage only for boats, while from the north end a reef makes out in a direction northwest by north for 300 yards, where there is a depth of 15 feet. The northeast side of the island may be approached to 200 yards.

Bayard Reef, with 9 feet water on it, lies parallel to Bayard Island, and is 880 yards long under the depth of 15 feet. The outer shoal portion of the bank is situated 880 yards northeastward from the northwestern extremity of Bayard Island, and between them is a depth of 4 to 5 fathoms.

Eaton Point is about $1\frac{1}{4}$ miles eastward of Vidal Island; a reef of dry stones extends 300 yards north-northeast from it, while the bight between Cyril Cove and Eaton Point is foul for 590 yards. Shallow water makes off 440 yards northward and northwestward of Eaton Point and from the west gravelly extremity of the latter the shore turns abruptly southward for 1,175 yards, forming the east shore of Cole Bay, from which a rocky bank extends 590 yards.

Cyril Cove.—From Eaton Point the shore trends southeastward, forming the western side of Cyril Cove, fit only for boats. A clay bank 440 yards long rises from the shore just southwest of Cun-

ingham Point, off which shoal water extends 250 yards, the rest of the shore being approachable to 150 yards.

Cunningham Point, with the land falling steeply down to it, is situated about $2\frac{1}{4}$ miles northeastward of Eaton Point. The northeastern part of the bay formed between Cape Robert and this point is of a cliffy character, conspicuous clay banks rising to a height of nearly 100 feet, off which a very shoal, rocky ledge extends 590 yards.

Cape Robert is the northern extremity of the promontory dividing Bayfield Sound from Vidal Bay. It is the most projecting point in North Channel of Lake Huron, and from the westward its white clay banks render it unmistakable. A patch of stones lies 70 yards and a shoal spit extends 200 yards northward of the cape. At 440 yards southward of the cape the wooded land rises considerably.

Light.—A fixed white light, 46 feet above water, visible 12 miles, is shown from a white, square, wooden structure on the north end of Cape Robert.

Anchorage.—A vessel will find excellent shelter from westerly gales under the east shore of Cape Robert 1.3 miles from the lighthouse in 5 fathoms, over sand and clay.

Bayfield Sound is a large inlet sheltered from the northward by Barrie and the Henry Island Group and together with Wolsey Bay forms really one large harbor nearly 17 miles long by a little over 5 miles in width at the widest part, but in 1888 the amount of shipping trade did not justify the survey being carried any farther than a line joining Elizabeth Point to Charlie Island. Enough has been done to enable a vessel to find shelter, whence she can with local assistance proceed farther up.

Sheshegwaning is the Indian Village situated about $4\frac{1}{2}$ miles southward of Cape Robert, and consists of a number of houses and a church; the latter, however, is not very conspicuous from the offing. An island 200 yards long, separated from the main shore north of it by a narrow boat channel, shelters the cove well from east winds, rendering it a good boat harbor. The whole of this shore between Cape Robert and the island may be approached to 200 yards.

Stony Island is a small, low, wooded islet situated 1 mile south-southwest of the Indian Village of Sheshegwaning, being connected to the point 300 yards northward of it by a bank of dry stones. Shoal water extends 150 yards off this point and Stony Island.

Cooks Bay.—From Sheshegwaning Village the shore trends slightly southwest for about $1\frac{1}{2}$ miles to Edward Bight, then south-eastward for about $2\frac{1}{2}$ miles to Gauthier Point, the western entrance point of Cooks Bay. Shoal water extends from 250 yards to 590 yards of this stretch of shore.

The bay lying between Gauthier Point and Battery Bluff runs in, southwesterly, over 1,175 yards with a depth of 12 to 15 feet, mud bottom. Halfway along the south shore of the bay is a wharf and fishery establishment known as Silverwater. In 1914 this L-shaped Government wharf was 180 feet long and 100 feet broad at the outer end, with depth of 14 feet. Shoal water extends 200 yards from the northwest side of the bay, reducing the anchorage space, which at the best is open to the north, and permits a heavy sea to roll in with gales from that direction.

Henry Patch, with 18 feet over sand, is situated 1 mile northward of Gauthier Point.

Battery Bluff is a steep cliff, 239 feet high, surmounting the coast of Manitoulin Island southwestward of Sackville Island; and between it and Elizabeth Point the coast takes the form of two bays. The shore under Battery Bluff may be approached to 100 yards.

Battery Bluff Anchorage.—There is excellent shelter and holding ground between this bluff and Sackville Island in 3 fathoms, with Cape Robert just showing westward of the latter. A vessel may also anchor in 15 feet, swinging in not less than 12 feet, mud bottom, in the mouth of the first bay southeast of Battery Bluff. If entering from the north between the two islands, 15 feet may be carried in by keeping 150 yards from the east coast of Sackville Island to avoid the bank extending from the west side of Stanley Island to nearly the middle of the passage.

If passing between Battery Bluff and Sackville Island, keep the former point on board to avoid the spit from the south end of the latter. The anchor should be dropped in 15 feet, mud bottom, with the north side of the Indian Village of Shesheganwaning touching the southwest point of Sackville Island bearing about 327° (N.NW. $\frac{1}{2}$ W.), in conjunction with Fish Point, west side of Barrie Island, in range with the northwestern extremity of Stanley Island 35° (NE. $\frac{1}{2}$ N.).

Elizabeth Point, on the Manitoulin Island shore, is the west entrance point of Elizabeth Bay, being situated 1 mile eastward of Battery Bluff; eastward of a line drawn between the point and Charlie Island the survey was not taken. Shoal water extends from this point north-northeast 350 yards, where there is but 11 feet.

Stanley Island, nearly 440 yards long north and south, lies a little over 590 yards westward from Elizabeth Point, and between is formed a shallow bay with sand and clay bottom, containing a depth of 5 to 6 feet; a depth of 17 feet will be found 440 yards north of Stanley Island.

Sackville Island, about 10 feet high and wooded like Stanley Island, is situated 440 yards northwestward of Stanley Island. The

water is deep near the north end, and shallow for 200 yards off the west side of the island, while between it and Stanley Island a vessel can carry 15 feet by keeping nearer to Sackville Island. From the south points of both these islands, narrow rocky spits extend 250 yards in a southerly direction.

Henry Island.—This, the largest of the group, is 1,175 yards in average diameter, about 30 feet high, and sparsely wooded; the southwest point may be approached to 300 yards, but on all other sides a shallow sand bank makes out, there being only 13 feet $1\frac{1}{2}$ miles southwest from the southwestern extremity of the island, while 1,175 yards in the same direction will be found the northwestern end of a reef with 3 feet water on it. To the southeast and south, this sandy bank, with 5 to 7 feet water on it, extends 1.3 miles from Henry Island, leaving a narrow channel with a depth of 15 feet between it and the shoal from Elizabeth Point.

Eastward of Henry Island the bank extends 1,175 yards, while northeastward a reef, with less than 6 feet upon it and in some places awash, joins Fanny Island.

Fanny Island.—This double island, 5 feet high, is the northeastern and smallest of the three, shoal water extending from its southeast point 590 yards in an easterly direction, and 200 yards northerly from the north end. Not more than 4 feet can be carried through between these islands.

Gertrude Island is the northern of a group of islands lying in the mouth of the sound. The western side is clifty, about 20 feet high, and slopes gently to the south. The water is good close to all but its southern coast, where a shallow bank extends across to Henry Island.

Shore.—From Elizabeth Point the shore trends southward about $3\frac{1}{2}$ miles to the bottom of Elizabeth Bay, then easterly and northerly to Shoal Point. As this stretch of shore, the southern shore of Barrie Island, and waters between them have not been surveyed no description will be undertaken.

Shoal Point is the southeastern side of the Julia Bay entrance to Bayfield Sound.

Barrie Island, $7\frac{1}{2}$ miles long east and west and 6 miles wide, in conjunction with the Henry Island Group shelters Bayfield Sound from the north.

Fishery Point, a part of the western extremity of Barrie Island, is a narrow gravelly spit 1,320 yards southwestward of Horace Point, and affords shelter to boats employed in attending the pound nets in the locality. From Fishery Point the coast of Barrie Island runs southward 1,320 yards, with a rocky bank extending from it 300 yards; it then turns southeastward 1,320 yards forming a stony bight to Dingy Point, farther than which the survey was not taken.

Charlie Island, small, 5 feet high, and thickly wooded, lies 440 yards westward of Dingy Point; scattered stones lie off its north and south sides, while to the west shoal water extends 250 yards.

Horace Point is the southwest entrance point of Trout Bay, shallow and rocky, which should be entered only by boats. A dangerous rocky bank extends over 590 yards northeast and north from Horace Point, falling like a wall to a depth of 12 fathoms, while the same bank, though not so shallow, stretches 1,175 yards west of the point, at which distance there is 14 feet of water. This bank may be avoided by keeping the southeastern extremities of Henry and Fanny Islands touching and bearing 208° (SSW. $\frac{1}{8}$ W.).

Jubilee Shoal is the shoalest part of a bank $3\frac{1}{2}$ miles long in a northeast direction and 1,175 yards broad under a depth of 10 fathoms. Jubilee Shoal has only 3 feet of water over boulders, and lies $4\frac{1}{2}$ miles 120° (SE. $\frac{1}{8}$ E.) from Cape Robert Lighthouse. The north fall of Battery Bluff over the highest part of Henry Island leads over the rock. The shoal under the depth of 18 feet is 1,175 yards long, with a greatest breadth of 440 yards.

Clearing marks.—Julia Point in range with Creighton Point bearing 77° (E. $\frac{1}{4}$ N.) leads south; the southeastern extremity of Henry Island touching the northwest side of Fanny Island, bearing 196° (S. by W. $\frac{1}{8}$ W.), leads west of Jubilee Shoal. The same extremity of Henry Island in range with the southeastern end of Fanny Island, bearing 208° (SSW. $\frac{1}{8}$ W.) leads east of Jubilee Shoal but does not clear Heron Patch.

Heron Patch, with 16 feet upon it, stands upon the same bank as Jubilee Shoal, and is 1.6 miles northeastward of it. It lies also 350 yards southward of the range joining Julia Point and Cape Robert.

Creighton Point, $2\frac{1}{2}$ miles northeastward of Horace Point, is well marked when viewed from the northwest, by a conspicuous clay bank 52 feet high, situated just westward of the point itself; shoal water extends 300 yards from the eastern part of the bay between Beer and Creighton Points. From the clay bank the shore turns away and runs straight in a southwest direction $1\frac{1}{2}$ miles, whence it trends south by east for $1\frac{1}{2}$ miles, forming the northeastern shore of Trout Bay.

Beer Point is situated a little over 1 mile east of Creighton Point, and from the eastern side of the bay formed between it and Osborn Point and $\frac{1}{4}$ mile from the latter is a cluster of dry stones off which shoal water extends 300 yards.

Osborn Point is $1\frac{1}{2}$ miles eastward of Beer Point. A shoal, rocky bank extends a good 440 yards from the eastern side of the bay formed between Osborn and Julia Points.

Julia Point.—This point is the most northerly and conspicuous of Barrie Island. Shoal water extends nearly 440 yards northward of the point and the same distance from the western half of Blackstock Bay.

Blackstock Point.—This point is nearly 5 miles 282° (WNW. $\frac{1}{4}$ W.) from Gore Bay Lighthouse, and the cliffs thickly wooded at the back of it rise to a height of about 250 feet. This point, as well as all the west shore of Julia Bay to Duroquet Point, may be approached to 200 yards. The north coast of Barrie Island consists of five wooded headlands very similar in appearance, inclosing four bays, the eastern and broadest of which is sometimes called Blackstock Bay.

The eastern side of Barrie Island will be described in conjunction with Julia Bay.

Directions.—If approaching Bayfield Sound from the west, pass 440 yards from Cape Robert Lighthouse and the northeast shore of the cape, and steer 155° (S. by E. $\frac{1}{4}$ E.) midway between Fanny Island and the western extremity of Barrie Island. Having arrived at the latter position, proceed southward and anchor either 590 yards west-southwest of Charlie Island in 4 fathoms, sand or clay, or 1,320 yards east of the southeastern extremity of Henry Island in 6 fathoms, mud, with the eastern extremity of Cape Robert in range with the northeast side of Fanny Island, bearing 337° (N. by W. $\frac{3}{4}$ W.), and Charlie Island in range with Dingy Point 91° (E. $\frac{1}{4}$ S.).

On the 7th of September, 1888, the surveying steamer *Bayfield*, in the first position, rode out a heavy gale, the wind commencing at southeast, veering through south, and ending at the northwest. When the wind came from the latter quarter the swell from Cape Robert caused the vessel to knock about a good deal, but she rode with very little strain upon the cables on account of a current setting to windward out of the sound; probably the water driven down North Channel of Lake Huron by the gales, returning through Julia Bay.

If approaching from the east, pass 440 yards from the clay bank at Creighton Point (Barrie Island) and head for the northwest side of Gertrude Island until the southeastern extremities of Henry and Fanny Islands are in range, bearing 208° (SSW. $\frac{1}{4}$ W.). Proceed now on this range to clear Horace Point Bank, and when Charlie Island is open its breadth west of Barrie Island, bearing 155° (S. by E. $\frac{1}{4}$ E.), steer in 171° (S. $\frac{3}{4}$ E.) at a moderate speed, with an occasional cast of the lead, passing rather nearer to Barrie than to Fanny Island to avoid the shoal bank extending from the latter, and anchor as previously directed.

A depth of 15 feet can be carried in between Henry Island Sand Bank and Elizabeth Point Spit by keeping the north fall of Cape

Lambert its height open of the point dividing Elizabeth and Helen Bays.

Julia Bay is a deep and square indentation east of Barrie Island contained between Janet Head and Blackstock Point. It is nearly 4 miles broad at the mouth and 3 miles long, and the water in it is very deep, there being 20 fathoms 440 yards from the bottom of the bay. This fact, together with the exposure to northerly gales, renders it unsuitable for anchorage, but should a vessel have to load timber here the best places are 440 yards northward of Duroquet Point in the southwest corner.

Blackstock Point, forming the northwestern entrance point of Julia Bay, has been described.

Duroquet Point.—From Blackstock Point the shore trends southward for 3 miles to Duroquet Point; it is very regular and may be approached to 200 yards. Duroquet Point, low and narrow, is situated 880 yards northwest from Shoal Point, and not more than 8 feet can be carried through between them. A reef with less than 6 feet on it extends southeastward just halfway across to the mainland shore. This strait, between Duroquet and Shoal Points, at $1\frac{1}{2}$ miles from Duroquet Point, is bridged over for the convenience of people living on Barrie Island, and is fit only for boats.

Shoal Point, on the mainland southeastward of Duroquet Point, has been described.

Botterell Point is a rounding point, close to which the water is deep, situated a little less than $1\frac{1}{4}$ miles eastward of Shoal Point. A line running east from this point marks the depth of 3 fathoms over sandy bottom.

Brymner Bay, with a smooth sandy beach, occupies the south corner of the right in the southeast corner of Julia Bay.

Hartney Cove, situated in the southeast corner of Julia Bay, north of Brymner Bay, is a long and shallow inlet running in a northeasterly direction 590 yards, and 440 yards westward from the mouth of this cove is a rocky bank with 15 feet over it.

Janet Head.—From Hartney Cove the shore trends northeastward nearly $2\frac{1}{4}$ miles to Janet Head. A shallow bank fringes this shore, the edge being 150 yards off the lighthouse on Janet Head and 250 yards at 880 yards west; then the bank gradually narrows until 880 yards from Hartney Cove, where the shore is steep-to. The northeastern half of this shore is well marked by a clay bank.

One-half mile westward of Gore Bay Lighthouse (later described) the clay bank is 148 feet high.

Gore Bay (Janet Cove) is $2\frac{1}{4}$ miles long north and south and $1\frac{1}{4}$ miles wide at the entrance, gradually narrowing to the bottom, and affords good anchorage in from 4 to 10 fathoms, over mud, the latter

depth being found 880 yards outside and the former 440 yards inside Town Point.

The town of the same name is the county seat for Manitoulin Island, and contained in 1911 a population of 703; meat and supplies can be obtained here and postal communication had almost daily with southeast ports of Georgian Bay and Sault Ste. Marie. There are four wharves here, the southern of which, 150 yards in length, and known as Merchants Wharf, has a depth of 15 feet. A telephone line connects Gore Bay with the other villages of the island and with the town of Little Current, which is connected with the general telegraph system.

Customs.—Gore Bay is an out port of entry.

Light.—A fixed white light, 43 feet above water, visible 11 miles, is shown from a white, square, wooden tower on Janet Head.

Fog signal.—The fog signal is made on a hand horn, which answers vessels' signals.

Town Point.—From the lighthouse the west shore of Gore Bay runs straight 2 miles to Town Point, off which a spit with 9 feet water on it extends 150 yards, and should be avoided when proceeding to or leaving the wharf.

Gorrel Point is a slight projection of the shore at the southwest end of East Bluff, and the shore for 1 mile northeastward of this point is fringed by a bank with under 6 feet water extending off 250 yards, and on which in westerly gales the sea breaks with great violence.

East Bluff is a steep bank, 254 feet high, over the eastern entrance point to Gore Bay and $4\frac{1}{4}$ miles west-southwest from Jessie Point, the shore between them 440 yards back rising to a height of about 200 feet, and approachable to 200 yards. The above bank being denuded of trees for nearly 1,320 yards is an unmistakable mark of recognition for Gore Bay, especially in the afternoon.

Jessie Point.—From East Bluff the shore of Manitoulin Island trends in a general northeasterly direction for about $4\frac{1}{2}$ miles to Jessie Point, off which shoal water extends nearly 440 yards.

Clapperton Channel separates Manitoulin and Clapperton Islands. It is contained between South Point of Clapperton Island and Francis Point on the east, and Courtney Island and the western part of Maple Point on the west, and may be navigated in daylight and clear weather by vessels drawing 12 feet of water (in low stages there may be $3\frac{1}{2}$ feet less).

South Spit extends 590 yards northward from Johnson Point, at which distance there is a depth of 12 feet, and a dry stone lies 350 yards northeastward from the same point. Between South Spit and Middle Bank is the channel, over 440 yards wide and 5 fathoms deep, and to lead between these two shoals keep South Point of Clapperton

Island in range with the north fall of Manitoulin Island bearing 97° (ESE. $\frac{1}{2}$ E.).

Maple Point.—From Jessie Point the shore trends east for $1\frac{1}{2}$ miles, then northeast by north a little over 1,320 yards to Johnson Point, then about 1,320 yards east-northeastward to Maple Point. This stretch of shore is fronted by shoal water which extends on an average of $\frac{1}{4}$ mile from it.

Burgess Reef, consisting of dry stones, lies near the shore about $1\frac{1}{4}$ miles eastward of Jessie Point. South Maple Point is a promontory which may be considered the southern entrance point of Clapperton Channel from the west.

Little Island, 3 feet high, is a narrow wooded islet, 80 yards in length, lying over 880 yards southeast from the northeastern extremity of Maple Point.

Little Island Bank is a large flat sand bank extending $1\frac{1}{2}$ miles from the east side of Maple Point, at which distance there is 8 feet water (in low stages there may be $3\frac{1}{2}$ feet less). This bank averages over 880 yards in breadth; its northern edge is tolerably straight and may be avoided by keeping on the leading mark above mentioned. Between this bank and Boulder Bank and northward of the fairway leading mark are four small rocky patches, the least water on which is 10 feet (1886). The mark which leads southwest of Meredith Rock also clears the east end of Little Island Bank.

Maple Bluff, 262 feet in height, is the turning point of the high bank which follows the coast around from Gore Bay to Mudge Bay.

Sutherland Shoal, with 15 feet water on it, lies a little less than 1 mile northeast from Sextant Point and 880 yards south by east from Little Island.

Sextant Point is situated 1.6 miles south of the northeastern extremity of Maple Point, having on its west side a small cove; about midway between these points is a still smaller indentation known as Sandy Cove.

Vankoughnet Island is the larger of the two islands situated at the southwestern extremity of Clapperton Island. Its length east and west is 1 mile and greatest breadth 1,320 yards. Between it and Clapperton Island there is a passage known as Indian Channel, through which 6 feet may be carried.

Courtney Island forms the north entrance point to Clapperton Channel from the west, and with the exception of the northeast side is surrounded with shoal water and joined to Vankoughnet Island by a bank of dry stones.

Courtney Bank.—The outer side of this dangerous and extensive bank of bowlders is situated over 880 yards westward of Courtney Island. It is 880 yards long northeast and southwest by a little

over 440 yards broad, with depths varying from a few inches to 6 feet.

Griffin Bank, the depth on which is 8 feet, lies north of the latter and 1,175 yards northwestward from the northwestern extremity of Courtney Island.

Western Reef, so called from being the westernmost of all the patches lying near the west entrance to Clapperton Channel, bears 270° (W. $\frac{1}{4}$ N.) 1.6 miles from the southwest point of Courtney Island. It is about 100 yards in diameter and with 11 feet of water over it. It has more than a local importance because it lies in the track from Clapperton Island Lighthouse to Gore Bay. A good channel 8 to 9 fathoms in depth and 1,320 yards broad separates it from the nearest shoals.

Clearing marks.—Clapperton Island Lighthouse, in the hollow of the hills at Fort la Cloche, bearing 60° (NE. by E. $\frac{1}{4}$ E.) leads 440 yards northwest of this reef. The southwest point of Innes Island touching the northeast point of Darch Island bearing 335° (N. by W. $\frac{1}{4}$ W.) leads 1,175 yards southwestward of Western Reef.

North Shoal, so called from its being the northernmost of the three banks which immediately front the west entrance to Clapperton Channel, is a rocky bank 880 yards long in an east by north direction, and 200 yards broad, with least depth 4 feet, its southwestern extremity being situated 1.1 miles southwest from the southwestern extremity of Courtney Island.

Middle Bank, with 4 feet on it, and perhaps the most dangerous obstruction in the west entrance to Clapperton Channel, is 300 yards long east and west, by 200 yards in width, and composed of bowlders. Its shoalest part bears 291° (NW. by W. $\frac{1}{2}$ W.) from the northern extremity of Maple Point. It is separated from North Shoal by a 5-fathom channel 440 yards broad, but in its present unbuoyed state should not be used.

Clearing mark.—To pass westward of Griffin Bank, Courtney Bank, Miall Patch, North Shoal, and Middle Bank keep the northwestern end of Mount McBean over the northwestern extremity of Benjamin Island, bearing 26° (NNE. $\frac{1}{4}$ E.).

Miall Patch, with depth of 12 feet, is situated over 1,320 yards west-southwest from the southwestern point of Courtney Island, being separated from Courtney Bank by slightly deeper water.

Spilsbury Islands, two in number and small, lie 440 yards from the southwest shore of Vankoughnet Island and are joined together by bowlders. A narrow and crooked channel, with a depth of 12 feet water, exists between these small islands and Vankoughnet Island. The water is fairly good on the west sides of Spilsbury Islands, 12 feet being found at 200 yards, but in a southeasterly direction extends a dangerous rocky bank.

Boulder Bank.—This shoal, lying southward of Vankoughnet Island, extends over 1 mile, with depths ranging from 1 to 7 feet.

Secord Point is the most western point of Clapperton Island. Snug Cove, 1,175 yards southeastward from Secord Point, is a good boat harbor.

Secord Bank is the shallow, rocky bank stretching southward from Secord Point to within 150 yards of Vankoughnet Island, leaving a passage of 12 feet (in low stages $3\frac{1}{2}$ feet less) close to the latter.

Sandfield Point, the southwestern extremity of Clapperton Island, forms the western point of Clapperton Harbor.

Clapperton Harbor.—The shore of Clapperton Island at Panet Point ($1\frac{1}{2}$ miles northwestward from South Point), trends abruptly northward and by recurving westward and southward forms a semi-circular bay in which is excellent anchorage and shelter from the heaviest gales.

Beverly Island.—This low, round little island, less than 150 yards in diameter, is separated from Sandfield Point by a boat channel. The eastern side is fairly steep-to, there being a depth of 21 feet at 150 yards. A patch with 2 feet water on it lies 590 yards west from Beverly Island.

Harbor Island, a little over 590 yards in average diameter, is the northernmost of the group. Its north and west sides are bold, but from its southeastern extremity a bar extends across to Panet Point, with depths on it varying from 4 to 10 feet. The best anchorage in Clapperton Harbor is under the northeast point of this island 200 to 300 yards from it in 5 fathoms over clay.

Meredith Island is nearly 1,175 yards southward of Harbor Island. It is the largest of the five islands in this locality, being separated from Clapperton Island by a shallow boat channel full of rushes. From the western point of this island a rocky ridge extends in a southwest by south direction, a little over 1,320 yards, terminating in a bank of boulders with only 1 foot of water on it.

Burbidge Island lies nearly 400 yards westward from Meredith Island, the passage between them containing a depth of 9 feet. A bank with as little as 1 foot of water on it in one place extends 350 yards westward from Burbidge Island.

Meredith Rock, which has deep water close to its southwest and eastern sides. The southwest point of Courtney Island touching the northern Spilsbury Island, bearing 314° (NW. $\frac{3}{4}$ N.) leads southward of Meredith Rock. The east side of Harbor Island touching the west side of Burbidge Island bearing 26° (NNE. $\frac{3}{4}$ E.), clears the west side of the whole of The Ridge.

Sailing vessels may stand toward Meredith Rock and The Ridge from the east until the west side of Meredith Island touches the east side of Harbor Island, bearing 2° (N. $\frac{1}{4}$ E.).

Beacon.—Upon Meredith Rock is a beacon painted white.

Mowat Island lies nearly 880 yards southeastward of Meredith Island. From its southwestern extremity shoal water extends in that direction 200 yards to a depth of 15 feet. The passage between Mowat and the main island is fit only for boats.

South Point derives its name from being the southern extremity of Clapperton Island. It is low and narrow, and from it extends in a southerly direction for 440 yards a shoal with less than 6 feet of water over it.

Directions for Clapperton Channel.—From the west, before the west end of Mount McBean comes over the western extremity of Benjamin Island, bearing 26° (NNE. $\frac{1}{4}$ E.), bring South Point of Clapperton Island under the north fall of Manitoulin Island, bearing 97° (ESE $\frac{1}{4}$ E.), which range will be open a little of Maple Point. This mark kept on will lead between South Spit and Middle Bank in not less than 4 fathoms water.

As Maple Point is approached, bring the north fall of Manitoulin Island sufficiently northward of South Point of Clapperton Island to clear the flat extending 100 yards from Maple Point. After the northern part of this point is passed, the leading mark should again be brought exactly on and kept so until nearly abreast of the eastern extremity of Little Island Bank, which position will be indicated by the northern Spilsbury Island touching the southwest point of Courtney Island, bearing 314° (NW. $\frac{1}{4}$ N.).

The latter mark should now be kept on astern until Meredith Rock is passed, of which a vessel will be sure when Meredith Island touches Harbor Island, bearing 2° (N. $\frac{1}{4}$ E.). From the intersection of these ranges a course 89° (E. $\frac{1}{4}$ S.) for $7\frac{1}{2}$ miles will take a vessel bound to Little Current to a position $1,320$ yards 152° (SSE.) from James Foote Patch, or, if proceeding to West Bay, she may continue with the Spilsbury Island mark astern, which will also clear the shoals off Francis Point.

If proceedings to Mudge Bay, a vessel may turn southward from the last-mentioned leading mark when Burbidge Island appears its own breadth east of Harbor Island, the latter bearing 30° (NE. $\frac{1}{4}$ N.). Approaching and passing through Clapperton Channel from the east, a vessel has little more to do than to reverse the courses given above.

Entering Clapperton Harbor.—To enter the harbor from the east, keep on the Spilsbury Island Range until the east side of Harbor Island touches the west side of Burbidge Island, bearing 26° (NNE. $\frac{1}{4}$ E.). From this position a 2° (N. $\frac{1}{4}$ E.) course will lead west of Burbidge Island Shoal, after passing which the course may

be altered more eastward, rounding Harbor Island at a distance of 200 yards and anchoring under its northeast point as directed.

From the west when upon the leading mark, as soon as Spilsbury Island range comes on, steer 42° (NE. $\frac{1}{4}$ E.) for the northwest point of Harbor Island. Give it a berth of 200 yards and anchor as before directed.

A vessel may cross The Ridge with 13 feet of water (at low stages there may be $3\frac{1}{2}$ feet less) by keeping the north fall of Manitoulin Island its own apparent height north of South Point of Clapperton Island.

North and East Coasts of Clapperton Island—Southern side of Main Passage.—Lewin Island, 5 feet high, is separated from Secord Point (described in connection with Clapperton Channel) by a boat passage 300 yards wide. A bank extends westward from this island 440 yards, where there is a depth of 13 feet. The north edge of this bank extends eastward 590 yards to a small wooded islet called Power Island.

Beattie Bay is the shallow bight between Senecal and Secord Points.

Shore.—From Beattie Bay the shore trends northeastward for nearly 2 miles, then eastward and to Cartwright Point. It is clean the entire stretch except that off the bight between Senecal and Blackstone Points shoal water extends 590 yards, the edge of which is very abrupt.

Clapperton Island Light, fixed white, 30 feet above water, visible 10 miles, is shown from a white, square wooden structure on the north point of the island.

Fog signal.—The fog signal is made on a hand horn, which answers vessel's signals.

Mudge Bay, between Gooseberry Island and Maple Point, is $3\frac{1}{2}$ miles wide; it has about the same length, and the whole space with two exceptions hereafter mentioned has a depth of 6 to $8\frac{1}{2}$ fathoms over mud, making it one of the finest anchorages in North Channel of Lake Huron. The village called Kagawong is situated near the stream in the south corner of the bay. It possesses a sawmill, hotel, post office, and church, with a population of 50 in 1901. Steamers running between Sault St. Marie and the southeast ports of Georgian Bay call here occasionally. It is also connected by telephone with Little Current and the other villages on the island.

Light.—A fixed white light, 38 feet above water, visible 11 miles, is shown from a white square tower, at the foot of Mudge Bay about 100 feet westward of the wharves.

Wharves.—There are two small wharves here, at the southeast and larger of which the depth is 19 feet.

Gray Point is the name given to a slight projection on the west shore of the bay nearly 2 miles south of Sextant Point. Between Gray and Sextant Points a bank extends 440 yards; all other shores of the bay may be approached to half that distance.

Shore.—From Gray Point the shore trends $2\frac{1}{4}$ miles southeastward to the village of Kagawong, then northeastward to Trudeau Point.

Trudeau Point is 1.1 miles west of Francis Point, and from it the coast trends abruptly southwestward, forming the southeast shore of Mudge Bay. A good passage 590 yards broad exists between Gooseberry Island on the west and Trudeau Point and Martin Reef on the east, through which $3\frac{1}{2}$ fathoms can be carried by keeping Lloyd's house (Ross house in 1888) at Kagawong its breadth open of the east shore of Mudge Bay, bearing 208° (SSW. $\frac{1}{4}$ W.).

Gooseberry Island, 250 yards long north and south, low and quite narrow, is situated nearly 880 yards northward of Trudeau Point and connected with it by a spit; its northern end should receive a berth of 200 yards.

McInnes Bank, with 12 feet over it, lies northwest by west nearly $1\frac{1}{4}$ miles from the north point of Gooseberry Island; it is composed of gravel and is about 200 yards in diameter. Depths under 4 fathoms extend 440 yards southwest and 200 yards northeast of the bank.

Martin Reef lies nearly 880 yards northeastward of Trudeau Point and about the same distance from the mainland. It is composed of dry stones 2 feet high and should not be approached from the north nearer than 300 yards.

Tache Island is the first island eastward of Trudeau Point and is nearly 1,320 yards from it, and from it extends in a northeasterly direction nearly 880 yards a patch of dry and sunken rocks known as Tache Island Reef.

Caution.—The shore from Trudeau to Francis Point is fronted by shoal water and should not be approached within 880 yards.

Francis Point.—This is the narrow northeastern extremity of the promontory dividing West and Mudge Bays. It may be also considered as the south entrance point of Clapperton Channel from the east. The east side of the point is tolerably steep-to, but shallow water extends 590 yards from the extremity of the point in a northeasterly direction and a little over 590 yards northward under the name of Tache Island Reef; care should therefore be taken in rounding the point to give it the necessary berth.

McRae Patch, with $3\frac{1}{2}$ fathoms over rock, lies 1.1 miles northeast from Francis Point.

The northern shore will now be described.

Secretary Island is separated from the western extremity of Croker Island by a boat channel 200 yards wide, and 10 fathoms will be found 100 yards from its south side.

Sow and Pigs is a group of bare and steep-sided rocks, the highest of which (31 feet), situated near the southwestern end of the group and called The Sow, lies nearly $1\frac{1}{4}$ miles north by west from Clapper-ton Island Lighthouse.

Benjamin Island, the next largest westward of Croker Island, attains an elevation of 160 feet, being nearly divided in two by a long bay running in on the south side; the islets and dry rocks on the south side should receive a berth of 300 yards.

Hook Island, 880 yards in greatest diameter, of limestone formation about 20 feet high and quite flat, is easily distinguishable by its contrast to the rough Laurentian formation of the islands north of it; it lies a little over 3 miles northwest from Clapperton Island Lighthouse.

From the northeastern extremity of Hook Island a shoal extends 200 yards, continuing to the west point of the island at 150 yards, the remainder of the coast of Hook Island being fairly steep-to.

McBean Channel is the passage from the eastern extremity of Fox Island to Little Detroit, of which the mainland shore forms the north side. This passage is 9 miles in length with least water 7 fathoms.

McBean Harbor, lying at the foot of the mountain of that name, has a depth of 15 to 28 feet, muddy bottom, and is landlocked by Anchor and Lee Islands on the west, and the mainland on the east. The entrance to the harbor is situated 1,175 yards north by east from Bald Rock, the east entrance point being known as Beaudry Point; the width of the entrance is 120 yards.

Black Island, so called on account of its timber, lies nearly midway between Bald Rock and the entrance, and is left on the starboard hand in proceeding to the harbor.

Irwin Island is the largest of a group, the nearest of which (a rock 2 feet high) to Bald Rock lies 440 yards northwest from it and is left on the port hand when approaching the harbor.

Another group, the largest of which is called Helen Island, lies midway between Irwin Island and the entrance to the harbor; a vessel passes east also of this group.

Directions.—To enter McBean Harbor pass from 100 to 150 yards west of Bald Rock and steer about 17° (NNE.) for the entrance, passing midway between Black and Helen Islands. In the narrows at Beaudry Point there is a depth of 6 fathoms, and when through them a vessel may anchor in $4\frac{1}{2}$ fathoms or proceed farther up, letting go in $2\frac{1}{2}$ fathoms abreast of Anchor Island. At the bottom

of this harbor will be found an Indian trail leading across to Spanish River, passing west of McBean Mountain. In the event of any metalliferous discoveries in this region McBean Harbor will be found a very useful port.

Fox Island, the easternmost of the islands which form the south side of McBean Channel, is from 30 to 50 feet high, and sparsely wooded, having an extreme length of $2\frac{1}{2}$ miles east and west and an average breadth of 1,175 yards. The north shore has an irregular outline, but no decided points, excepting Jones Point, 590 yards westward of Bald Rock, narrowing the channel between it and Irwin Island to 200 yards, in which, however, there is a depth of 15 fathoms.

Bower Rock, 4 feet high, lies 230 yards off the middle portion of Fox Island and 1.3 miles westward of Bald Rock; the channel is between it and Fox Island, not having less than 7 fathoms; shoal water extends 200 yards westward and 590 yards eastward of Bower Rock.

Hotham Island, about 50 feet high and $1\frac{1}{4}$ miles long, is situated on the north side of McBean Channel, with its southeastern extremity north-northeast 590 yards from Bower Rock, to which it is connected by a shoal bank.

Pardee Islands are two islets, the southern of which, 15 feet high, lies 300 yards from Hotham Island and 440 yards northwest by north from Bower Rock.

Frechette Island is the next west of Fox Island, being separated therefrom by deep water 1 mile broad; the island is triangular in shape, 1.3 miles in length, and about 50 feet high, its northeastern extremity being known as Gillmor Point. The channel here is 350 yards wide, with a depth of 20 fathoms.

Hood Island, the middle of which is opposite the last-mentioned point, is $1\frac{1}{2}$ miles in length, being almost joined to Hotham Island on the east. The water is deep close to both these islands, excepting a rock with 11 feet on it lying 150 yards off Hood Island and 880 yards northwestward from Gillmor Point.

Graham Point is a projection of the mainland 150 yards westward of Hood Island; hence the main shore, elevated about 150 feet and sparsely timbered, continues in a general northwest by west direction for nearly 3 miles to Houghton Bay, an indentation over 590 yards square, with dry rocks at the mouth called Houghton Rocks, the highest of which is 6 feet high.

Shoepack Bay is a broad and deep arm, the bottom of which is formed by the south shore of the long and crooked peninsula dividing the waters of McBean Channel from those near the mouth of Spanish River. In the western corner of the bay there is a depth of 7 to 8 fathoms, over mud.

Haggarty, Hawkins, Crooks, and Boyd Islands, with the small islets and rocks between them, are situated on the south side of McBean Channel, Boyd Island being over 2 miles west of Frechette Island. The water is deep close north of this chain.

Boyd Island lies 2.1 miles westward of Frechette Island.

Light.—A fixed red light, 41 feet above water, visible 6 miles, is shown from a white, square, wooden structure on a rock about 80 yards southwest of Boyd Island.

Hiesordt Rocks.—Of these smooth rocks the northwestern one, 5 feet high, is over 880 yards north of the lighthouse. The southeastern rock, 1 foot high, lies 880 yards north-northeast from the same. A flat makes out 150 yards westward from the western Hiesordt Rock, but the water is deep between these rocks and the lighthouse.

Symes Rock, with 14 feet water over it, is a flat reef situated 440 yards southward from the south point of Hook Island, leaving a depth of 5 fathoms between them.

Eagle Island is the largest of the group under description, being $2\frac{1}{4}$ miles in length and $1\frac{1}{4}$ miles in greatest breadth; a large bay indents the north side, near the bottom of which is a dark wooden summit 198 feet high, the highest part of the island. The water is deep between Eagle, Hook, and Benjamin Islands.

Gull Rock, 13 feet in height and bare, lies $1\frac{1}{4}$ miles northwest by west from Hook Island; shoal water extends from the east side 100 yards, the other sides being steep-to. Gull Rock is separated from Proudfoot Point of Eagle Island by a deep channel a little more than 880 yards wide.

Amour Island is a small island situated 100 yards off the northwestern extremity of Eagle Island, the shore between it and Proudfoot Point, distant 1 mile, being indented by several coves.

Mazeppa Rock, with 11 feet on it, lies over 1,320 yards northwest by north from Gull Rock. Shoaler water was reported about 880 yards northwest from Mazeppa Rock, but a full day's search failed to find it.

Banshee Rock, with 12 feet on it, lies south-southeast nearly 1 mile from Boyd Island Lighthouse; a rock with 4 feet water on it lies southeastward nearly 880 yards from the same and 350 yards from Crooks Island, and from the rock the mill chimney is open a little southwest of the lighthouse.

Clearing marks.—To pass west of the above dangers, keep Boyd Island Lighthouse in range with the western Hiesordt Rock bearing 358° (N. $\frac{1}{4}$ E.). The south side of Hook Island in range with the south side of Gull Rock, bearing 120° (SE. $\frac{1}{4}$ E.), leads southwestward of Mazeppa Rock.

Hoskin Islands.—Between the lighthouse and Aird Island is a labyrinth of islands and rocks, the eastern group being known as Hoskin Islands. The eastern dry rock of the group is situated 1,320 yards west-northwest from the lighthouse. The only channel to be recommended is that close west of the lighthouse, and in proceeding to or from Little Detroit by it a vessel will pass east of the following dangers, with their positions relative to the lighthouse:

A reef, with 15 feet south by west, 590 yards; a patch, with same depth, west-southwest 440 yards; and a rock, with 6 feet, west by south 880 yards.

Arnold Rock, with 12 feet, lies southwest by south 590 yards from the lighthouse.

Lumsden Rock, with 7 feet water on it, lies a little over 440 yards northwest from the lighthouse and is the most awkward rock in the locality. A vessel will pass northeast of it by keeping the southwest side of Hook Island in range with Boyd Island Lighthouse, bearing 143° (SSE. $\frac{1}{2}$ E.).

Buoy.—A black spar buoy marks the north edge of this rock.

Directions for McBean Channel.—From Bald Rock keep the coast of Fox Island on board until 440 yards west of Bower Rock, when steer for Gillmor Point. Keep mid-channel here and steer for the mill which will now be in sight; when halfway to the latter a vessel, if bound through Little Detroit, may haul a little northward for the entrance.

Little Detroit separates the eastern part of Aird Island from the narrow and crooked peninsula of the mainland, forming the north and west shores of Shoepack Bay. The narrowest part of the passage is only 38 yards in width, with a depth of 21 feet (in low stages there may be $3\frac{1}{2}$ feet less). The mainland side of the passage is steep-to, but from Aird Island a rocky flat extends from Mary Island and Ethel Rock, narrowing the passage to the breadth above mentioned.

In 1917 the steamboat channel through Little Detroit was improved by removing the rock north of Ethel Rock and by cutting the north end off the point west of Ethel Rock, giving a clear channel 75 feet in width and with a least depth of 18 feet of water below 580 feet above mean tide New York.

The best water will be found within 40 feet of the point and 65 feet from the north end of Ethel Rock.

Directions — Clapperton Island Lighthouse to Little Detroit.—Proceeding from Clapperton Island Lighthouse to Little Detroit, when the lighthouse bears 130° (SE.) distant 880 yards a 297° (NW. by W. $\frac{1}{2}$ W.) course should be steered to pass 880 yards southward of Hook Island to avoid Symes Rock. When the west side of the latter island bears 355° (N.) the rock will be passed and a

vessel may haul a little northward, giving Gull Rock a berth of 440 yards, passing which keep it closed with Hook Island until the western Hiesordt Rock is in range with Boyd Island Lighthouse, bearing 358° (N. $\frac{1}{4}$ E.). Proceed on this leading mark, passing 150 yards west of the lighthouse and steer for the mill or Little Detroit as necessary, taking care to keep the southwest side of Hook Island closed, or in range with the lighthouse bearing 143° (SSE. $\frac{1}{4}$ E.) to pass northeastward of Lumsden Rock.

Aird Island—East end.—The eastern extremity of this island is situated 1.6 miles northwest of Boyd Island Lighthouse and a rock with 1 foot water on it in 1887 lies 370 yards southeastward from it and 250 yards southwest of the track from the lighthouse to Little Detroit.

Mill.—Distant nearly 880 yards north-northwest from the above extremity is a sawmill belonging to the Spanish River Lumber Co., the wharves situated just east of the mill having depths at them of 10 to 16 feet. The mill when in full operation and its tall smoke-stack and sawdust burner were very conspicuous from the east.

Arnold Point, the south entrance point of Little Detroit from the east and 370 yards southeastward from Little Detroit Wharf, has deep water close to it.

Whalesback Channel is the passage north of Aird and John Islands, from Little Detroit to Turnbull Island $3\frac{1}{2}$ miles southeastward of Algoma Mills, and is so called from a rock somewhat resembling the body of a whale, the eastern end being like the head which is the highest part and 45 feet high. This rock is a little more than 10 miles from Little Detroit, and a little less than 9 miles from Algoma Mills. The narrowest parts of the channel are at Little Detroit and again at John Island; at the latter, however, the water is very deep, while at Little Detroit the most water is 21 feet, as mentioned in connection with McBean Channel.

Green Island, 163 feet high, presumably so called from its timber, lies on the north side of Whalesback Channel, and westward of the channel to Spanish River; it is 1.3 miles long in a northeast by east direction, by 1,175 yards wide in its widest place, and its southeast side has deep water close to it.

Shanly Island lies southwestward of the last mentioned, being separated therefrom by a narrow boat channel. It is 1,175 yards long with an average breadth of 300 yards and of considerable elevation, its southeast side being of a cliffy character.

Passage Island is the island on either side of which there is a good channel for the largest vessels. It is 880 yards long and 440 yards wide, the east end being steep to. The channel between it and Shanly Island is 440 yards wide, with a depth of 11 fathoms.

Brown Island, about 50 feet high, is just separated from Villiers Island west of it by a narrow channel. The two islands together are quite narrow and a little over 1,320 yards long, the water being deep on all sides.

Otter Islands, two in number, lie northwest and southeast of each other, the eastern one being separated from Villiers Island by a good passage 150 yards wide, with a depth of $4\frac{1}{2}$ fathoms. This channel will be recognized by the round rock 15 feet high, lying close to the western extremity of Villiers Island.

Jackson Island, 1,320 yards long, is the western of the string of islands lying north of Aird Island, being separated from the western portion of the latter by a narrow boat passage.

Aird Island—North coast.—Near the eastern extremity of the island there is a deep indentation forming a double cove, and known as Cameron Bight, being separated from Little Detroit by a promontory called King Point, close to which the water is deep. Off the mouth of Cameron Bight the Spanish River Lumber Co. has erected extensive wharves for shipping lumber, which is carried from the mill on tramways. The western extremity of Cameron Bight is called Jacob Point, whence the shore trends in a general westerly direction $1\frac{1}{2}$ miles to Baxter Point, situated 440 yards south from the southeastern extremity of Passage Island.

Schultz Island, 22 feet high, small and round, with a small dry rock 70 yards north of it, lies 590 yards southeast by south from the east end of the southeast Otter Island and helps to point out the passage.

From Schultz Island the north coast of Aird Island continues in a westerly direction 1.6 miles, where it abruptly turns northward. For more than 1,320 yards westward of Schultz Island the water is deep, and here a vessel will find good anchorage if wishing to wait for daylight.

Klotz Island, about 100 feet high and separated from the western extremity of Aird Island by a narrow and shallow boat channel, is 1 mile long and 440 yards in average width.

Newport, a small fishing station, is situated on Klotz Island, at the north end of the channel between Klotz and Rainboth Islands. There is a small wharf here, at which there is 12 feet water.

Casey Shoal, with 13 feet water on it, lies 1,175 yards northwest from the mouth of the channel separating Klotz and Aird Islands, leaving a depth of 15 fathoms between the shoal and Klotz Island.

Rainboth Island is round and 590 yards in diameter, being divided from Klotz Island by a narrow boat channel.

Aikens Island is the next west of Rainboth Island; between them there is a passage for a ship, but as a rock with 9 feet water over it lies in the middle of the passage it is not recommended to a stranger.

Aikens Island is a little over 1 mile in length east and west and helps to shelter Moiles Harbor.

Amyot Rocks are a cluster, 3 feet high, lying from 200 yards to 440 yards northwestward of the eastern extremity of Aikens Island.

A rock with 12 feet on it is situated nearly 590 yards north-northwest from the same extremity.

Weldon Shoal, with 18 feet of water on it, lies 350 yards northwest from the western Amyot Rock.

John Island, 250 feet high, the north side of which forms the south side of Whalesback Channel, is 4.6 miles long, with a maximum breadth of nearly $1\frac{1}{2}$ miles.

Bergeron Point is the most easterly projection on the Whalesback Channel side of the island, being separated from Aikens Island by a small island between which and Aikens Island is the north entrance to Moiles Harbor.

Davin Point.—From Bergeron Point the north coast of John Island trends west by north 1,175 yards and then northward 880 yards to Davin Point, with deep water close to the shore, excepting at the latter point itself, where a rock with 10 feet water on it lies 100 yards off.

Moiles Harbor.—This perfectly sheltered basin is situated near the eastern extremity of John Island and contains a sawmill erected by the people after whom the harbor is named. Two passages lead into it, that from Whalesback Channel taking the name of North and the other, from North Channel of Lake Huron, being called East Entrance. By the former 4 fathoms may be carried in and by the latter 14 feet, while at the wharves ample water may be had.

Directions.—A vessel bound to Moiles Harbor from Mississagi Straits should pass 440 yards northwest of Meldrum Point and then steer 71° (ENE. $\frac{3}{4}$ E.), which leads 1 mile northwest of Batture Island and $1\frac{1}{2}$ miles southeast from Europa Reef.

After running on this course for 32 miles, a vessel will arrive at the 10-fathom curve 880 yards southeast of Beaufort Reef and with Mount Victoria over the middle of Rainboth Island bearing 34° (NE. $\frac{1}{2}$ N.). Proceed on this leading mark for $1\frac{1}{2}$ miles, when the vessel should be abreast East Entrance to the Harbor, 880 yards westward, and should signal for a pilot.

If approaching Moiles Harbor by North Entrance from Whalesback Channel care should be taken to pass westward of the rock with 5 feet on it lying 150 yards off the northwestern point of Aikens Island.

Flood Island is small, 20 feet high, and the water is deep close to the north side.

Nicholas Island is somewhat similar, but lower, and is situated a little over 590 yards westward of the latter and south-southeast 320

yards from a round conspicuous dry rock 7 feet high on the north side of the passage, close to which the water is very deep.

A rock with 5 feet of water on it lies west-northwest 150 yards from Nicholas Island, limiting the breadth of the channel to 200 yards.

Waters Point is 590 yards westward of Nicholas Island, and 100 yards off it is a rock with 1 foot of water on it, the channel between this shoal point and Parsons Island being narrowed to 250 yards but with a depth of 13 fathoms.

Camp Point is 1 mile westward of Waters Point, and east of it are two coves off which a flat extends 150 yards.

West Point is the western extremity of John Island; it is situated 1 mile southwest from Whalesback and nearly $1\frac{1}{2}$ miles west by south from Camp Point.

Dixon Islands, two in number, are about 15 feet high, with a few trees on them, the northern one 590 yards southwest by west from Whalesback, between which is the channel.

A rock awash lies 590 yards eastward from the north Dixon Island and 360 yards southward from Whalesback. Keeping the latter close on board will avoid this danger, as will also the north point of John Island in range with the south point of Nelles Island bearing 89° (E. $\frac{3}{4}$ S.).

Goalen Island, 15 feet high, lies 350 yards north-northeast from West Point.

Bradley Rock, with 3 feet of water over it, is a very awkward danger, having already brought up several vessels; the whole bank is 350 yards long east and west, the western end being the shoaler. The latter spot lies west by north 590 yards from Goalen Island, and the track is between it and Fraser Rocks.

Clearing mark.—To pass northward of Bradley Rock, keep the north side of John Island (Waters Point) open northward of the northern Dixon Island bearing 85° (E.).

NOTE.—Having given a brief description of the islands and dangers on the south side of the eastern and greater portion of Whalesback Channel, those on the north side will now be described.

After emerging from the east into the more open water southwestward of Aird Bay, a vessel will meet with nothing north of her track until approaching the eastern and largest island of the group lying between John Island and the main shore.

Norquay Island.—One-half a mile north of the Whalesback Channel track from Little Detroit to Turnbull Island, this island lies with its eastern end nearly $4\frac{1}{2}$ miles from Whalesback. This and Greenway Island, 200 yards west of it, are each about 100 feet high, and 880 yards long east and west with precipitous sides.

White Island, 76 feet high and 120 yards northward of the eastern part of Greenway Island, has a conical summit the quartz of which it is composed giving it the conspicuous appearance whence it derives its name.

Spotted Island is so called from the circumstance of its being patchy, especially on the northern side. It is about 30 feet high, 200 yards in length, and lies a little more than 440 yards westward of Greenway Island.

Daly Islands.—The western one has a conical summit 53 feet high, which, with its perpendicular south side, renders it a conspicuous object, especially to a vessel using the channel northward of the island next described.

Parsons Island, about 60 feet high, in two principal parts, is situated with its northeastern extremity nearly 2 miles eastward of Whalesback; a passage exists on the north side of the island, but on account of a rock with 6 feet water on it lying 350 yards north by east from the western extremity, it is better for a stranger to use the broader and generally used channel southward of Parsons Island.

The southeast side of the latter has several dry rocks and islets lying off it, the farthest being a small rock 7 feet high situated 350 yards from its east end and alluded to in connection with Nicholas Island. A small rock with 8 feet water upon it lies 225 yards west-southwest from the west end of Parsons Island, and is a very awkward danger for vessels passing north of Nelles or Robin Island.

Robin Island, small, round, and 25 feet high, lies west-northwest nearly 590 yards from the western extremity of Parsons Island; and 300 yards west from Robin Island is a rock with 9 feet water on it.

Nelles Islands, in two parts, with a round rock near the west end of the larger Island 11 feet high, are situated 440 yards northward of Camp Point. There is deep water on either side of these islands, but the 9-foot rock mentioned in the last paragraph makes it advisable for a stranger to adhere to the passage southward of Nelles Islands.

Whalesback.—This bare precipitous rock has a shoal with 24 feet water over it lying 300 yards westward from its western and lower end, but with this exception the water is deep all around it and between it and Nelles Islands; so deep is the water on the south side, and wall like the side of the rock, that the surveying steamer *Bayfield* in 1887 was lashed alongside while disembarking a camp party, which, to avoid the flies, was stationed there for a month. There are several other islands lying between the string just described and the main shore, but as the passages among them are not to be recommended their description has been deemed unnecessary.

Gowan Island, 89 feet high, is the first west of John Island, being separated therefrom by a boat channel 100 feet wide. The

west point of this island forms the north entrance point of John Harbor.

Le Sueur Island, a little lower in height, lies westward of Gowan Island, the nearest extremities being 880 yards apart and between which is the entrance to John Harbor. Le Sueur Island is 590 yards in diameter, the north shore having deep water close to it. The water is also equally deep between it and Colmer Ground, the name given to a patch with 21 feet on it lying nearly 880 yards northwestward of its northwestern extremity.

A group of three islands, named, respectively, commencing from eastward, Alfred, Decelles, and David Islands, divides Whaleback Channel from the broader waters of North Channel of Lake Huron, and there is no passage between these three islands except for boats.

David, the smallest and western island, has a rock with 15 feet on it lying 300 yards northeastward from its northwestern extremity. A rock 9 feet high is just separated from the west point of the island.

Mills Island, 58 feet high and about 120 yards in diameter, is separated from the group last mentioned by a channel over 590 yards wide. With the exception of a rock with less than 6 feet water on it lying 50 yards off its northwest side the island is steep-to.

Scott Island, the bare south fall of which is 127 feet high, the wooded summit of the island being a few feet higher, is over 590 yards long east and west and 440 yards wide. It is a conspicuous feature commanding the approaches to Serpent River and Algoma Mills from the southwest and southeast. It is situated over 1,320 yards westward of Mills Island, and the ridge joining them having no less than 6 fathoms on it affords a good passage, taking the name of Scott Island, into or out of Whalesback Channel.

Whitcher Island, 300 yards long north and south by 200 yards broad, is situated north by east 1,175 yards from Mills Island, the water between them being 18 fathoms deep. This island may be known by a rock 4 feet above the water lying 170 yards eastward from its northeastern extremity, and which has a rock with less than 6 feet water on it lying 100 yards southeastward of it; with this exception, the water is very deep round this island.

Sylvain Island, 43 feet high, lies west by south 1,175 yards from Whitcher Island. A small wooded islet lies 250 yards eastward of the island, and close to the east side of this islet the water is deep, leaving a good channel 590 yards wide between it and Whitcher Island. The northwest side of Sylvain Island should not be approached within 150 yards, a shallow ledge making out nearly that distance. The water is deep on the north and south sides of both islands.

Peter Islands, two in number, quite low and 200 yards apart, lie 250 yards northward of Scott Island; one rock, awash, lies close to

the east end of the eastern island, and a second is situated 180 yards southeast from the same extremity.

Robb Rocks, 8 feet high, lie north a little under 1,320 yards from the western extremity of Scott Island. Westward of them 200 yards is a small rock 4 feet above the water, and nearly the same distance eastward is situated a rock awash. •

Minstrel Rock, in two parts, 5 feet high, lies northwest a little over 880 yards from the same part of Scott Island.

Tug Reef, awash, is situated 440 yards north by west from the western Minstrel Rock; shoal water extends 150 yards northeastward from the top of this reef.

Turnbull Island, a little over 1,320 yards long, 30 feet high, and sparsely wooded, will be seen ahead soon after passing westward of Whalesback. It is the eastern of a group of islands lying south of Algoma mills, and its eastern coast is steep-to with the exception of a patch on which there is a depth of 9 feet at low stages of the water lying 250 yards eastward of the southeast point of the island.

NOTE.—The description of the islands and coast on the north side of Whalesback Channel will now be continued.

Fraser Rocks, four in number, the highest being 8 feet high, lie nearly 1,175 yards westward from Whalesback, and 350 yards off Wicksteed Point of the main shore; the channel is southward of these rocks, which are steep-to on that side.

Turtle Rock, 13 feet high, is situated westward $1\frac{1}{2}$ miles from Whalesback; the water is good all round the rock, but the deeper and more direct track for a vessel is south of it.

Page Rocks consist of two, the eastern being 1 foot while the western is 6 feet above the water. They are 350 yards apart, the western one being 440 yards off the main shore, and over 1,320 yards west by north from Turtle Rock.

Chapman Reef with 14 feet on it lies 440 yards southwest by west from the western Page Rock.

Knight Point, 3.6 miles west by north from Whalesback, is the westerly termination of the comparatively straight shore of the mainland about 100 feet in height, forming the north side of Whalesback Channel. Thence, the shore abruptly turns northward in a succession of long bays.

Godfrey Islands are a group of three, the western of which is 22 feet high and lies rather over 880 yards from Knight Point; a small rock with less than 6 feet water on it lies 150 yards southwestward of it. Otherwise the islands are steep-to on the channel side.

La France Rock, with 11 feet water over it (in low stages there may be $3\frac{1}{2}$ feet less) lies a little over 590 yards south-southwest from the eastern extremity of the southeastern Godfrey Island, and has deep water all round it.

Prendergast Islands, three in number, are situated 440 yards northwestward of the group last mentioned, and are the most westerly islands in this locality; they are steep-to on the west and south sides.

Directions—Whalesback Channel.—In passing through Little Detroit from the southeast, keep the northeast or main shore on board to avoid a rocky bank extending from Mary Island and Ethel Rock; when up to the narrows keep in mid channel, and when round King Point a 262° (W. $\frac{1}{4}$ S.) course for 2 miles will take a vessel to the western extremity of Shanly Island, or, for 2.6 miles, to the west end of Passage Island. Haul northward on either side of the latter and steer 271° (W. $\frac{3}{4}$ N.) for 7 miles if taking the channel east of passage island, when a vessel will be abreast and northward of Nicholas Island. It may be remarked that this course leads over a patch on which there is 21 feet, lying 1,175 yards southward from the east end of Norway Island.

Passing between Nicholas Island and the little dry dock 7 feet high on the north side, a 262° (W. $\frac{1}{4}$ S.) course for $1\frac{1}{2}$ miles will bring a vessel southward and abreast of the detached rock 11 feet high at the western extremity of Nelles Island. Passing 150 yards from the latter, haul a little northward to pass the same distance south of Whalesback, and so avoid the rock awash situated as before stated 360 yards southward from Whalesback.

From this position steer 263° (W. $\frac{1}{4}$ S.) to pass 200 yards on the same side of Turtle Rock and avoid Bradley Rock with 3 feet on it, to insure which, see that the north shore of John Island is in a range with or open north of the northern Dixon Island bearing 85° (E.). Turnbull and Bassett Islands will now be seen ahead, appearing as one; steer rather nearer the south end than the middle of them until past La France Rock, when haul up for the north end of Bassett Island and proceed as later directed.

Craftsman Point is the first projection of this peninsula after passing through Little Detroit, from which it lies 440 yards northward, the bight between them having deep water close to the shore.

Landry Point is situated northward 880 yards from Craftsman Point, the shore between them forming a deep bight. The coast of the peninsula now runs north-northeast for 440 yards, forming with the coast of Green Island a strait 260 yards wide in its narrowest part, with a depth of 4 fathoms; the coast now turns away eastward with several coves and points for nearly 3 miles, forming the south shore of Frenchman Bay, along which can be carried to within 1,175 yards of the bottom not less than 3 fathoms.

Sproule Islands, the western and smaller of which is 13 feet high, are two in number, lying 230 yards northeastward of Green Island, the passage between them having a depth of 16 feet. Vessels

were formerly in the habit of taking the shorter track to Buswells Mill in preference to passing northward of Sproule Islands, where there are 4 to 5 fathoms of water.

A rock with 4 feet of water over it lies 100 yards westward from the western Sproule Island, to lead southwest of which, with 17 feet water, keep Landry Point, already mentioned, closed with the northeastern extremity of Green Island 163° (S. by E.).

A reef with 11 feet on it is situated west-northwest a little over 590 yards from the northeastern extremity of Green Island.

Northwestward of Green Island are three islands, the southern and smallest of which is Wilfrid, and the central and largest called Laurier Island. The passage between them and Green Island is fit only for boats, the same remark applying equally to the channel between Laurier Island and northern one named Gervase Island.

Gervase Island.—This narrow and partially wooded island is of importance, as lying not far southward of the track of vessels to Buswells Wharf from the west. Its northwestern extremity, consisting of a round rock 13 feet high, is situated 1.6 miles southwest by west from Buswell Point.

A rock with 1 foot water on it lies north-northwest 200 yards from the dry rock at the northwestern extremity of Gervase Island, and the shoalest part (14 feet) of a mud bank lies 1,320 yards eastward from the same dry rock.

Whiteaves Island, small and wooded, is the western one of a string of islands separating the approach to Spanish River from Frenchman Bay; it lies north by east 440 yards from Sproule Islands, with 4 to $5\frac{1}{2}$ fathoms between. A reef extends 200 yards from the west side of Whiteaves Island, and shoal water extends 100 yards from the south side. A small dry rock 3 feet high lies 100 yards eastward of the island.

Fletcher Islands are a group of three lying 1 mile east by north from Whiteaves Island, and 440 yards southward of the group is a small islet 10 feet high known as Forbes Island, marking the north edge of the channel to Frenchman Bay.

Tomlinson Islands, two in number, are situated 880 yards eastward of the above group; an islet 23 feet high lies 200 yards southwest of the western and smaller island.

Rock Island, the easternmost and largest of the string, being over 1,320 yards long, is separated from the mainland by a narrow passage but deep enough to raft logs into Frenchman Bay.

Spanish River.—The origin of the foreign name given to the river is obscure, but one reason assigned to it is that a Spaniard from Mexico settled over a century ago on the upper waters of the river, marrying the daughter of an Indian chief. The wharf on the north side of the mouth of the river is situated $2\frac{1}{2}$ miles eastward from the

western extremity of Buswell Point, and close to the mouth is Spanish Station of the Sault Ste. Marie Branch of the Canadian Pacific Railroad. The depth of 3 fathoms can be carried only to Fletcher Islands, 1 mile eastward of Buswell Point, but light-draft steamers enter the river and proceed as far as the first rapids, 10 miles from the mouth. Tugs are employed by the lumber companies in towing to their respective mills the large quantity of logs annually cut near the upper waters of this river.

Buswell Point.—From the wharf at the mouth of Spanish River the shore, 151 to 97 feet high, runs nearly straight in a series of cliffs to Buswell Point and is shallow.

Buswells Wharf is situated in a bay immediately northward of the point of that name, its outer end being in 1887 only 120 yards northwestward therefrom. The wharf at that time was nearly 440 yards long and had a depth of 12 feet. Its distance by the channel from Little Detroit is about 3 miles.

In the approach to the wharf is a rocky patch with 9 feet water on it (in low stages there may be $3\frac{1}{2}$ feet less) situated 440 yards south-southeast from Buswell Point.

Indian John Point is a low, broad projection 1,320 yards west of the wharf, and 150 yards southward of this point is the eastern and largest one of a chain of five islands, and called Kirke Island.

Kirke Island.—The east point of this island is 590 yards from Buswell Point, the line joining them marking the limit of the depth of 3 fathoms; shallow water extends 250 yards from its south side.

Directions—Little Detroit to Buswells Wharf.—After passing through Little Detroit give Craftsman Point a berth of 200 yards, and head for the passage a little eastward of 355° (N.); when at the narrows between Landry Point and Green Island keep mid-channel, and passing east and 200 yards northward of Sproule Islands, steer 287° (WNW.) until the mill stack (if standing) opens or comes in range with Buswell Point 23° (NNE. $\frac{1}{2}$ E.), when it may be steered for, and a berth taken up at the wharf.

A vessel can carry 16 feet between Green and Sproule Islands by keeping mid-channel and taking care to pass southwest of the rock near the western Sproule Island by keeping Landry Point closed with the northeast end of Green Island 163° (S. by E.); when west of this rock steer for Mount Victoria until the stack and Buswell Point come in range, when proceed to the wharf.

Gulnare Point is the termination of a thickly wooded peninsula about 150 feet in height and may be approached to 200 yards. The point is situated a little over 3 miles west by south from Buswell Point, the shore between taking the form of a shallow bight, hidden from sight by a chain of islands, the eastern and highest of which is Kirke Island.

Brewerton, the western island of the chain, is separated from Gulnare Point by a channel 590 yards wide, containing a depth of from 5 to 7 fathoms, muddy bottom. The coast of Brewerton, and those of the three islands between Kirke Island and it, are steep-to.

Aird Bay is a deep indentation of the north shore contained between Papineau Island in the east side and Bartlett Point nearly 3 miles west of it; and from the middle of this line the bay trends northeast 3 miles.

Cutler, a post office and station on the Sault Ste. Marie Branch of the Canadian Pacific Railroad, is situated at the head of Aird Bay. It possesses a large steam sawmill and extensive wharves, at which 18 to 24 feet water will be found. The mails for Gore Bay are taken by tug from this village.

Customs.—Cutler is an out port of entry.

Papineau Island is triangularly shaped, the north side being clifty and about 100 feet high. It is separated from Gulnare Point by a shallow channel 300 yards broad, and its south extremity, though low and sharp, may be approached to 100 yards.

Curran Rock, awash, is situated west-northwest a little over 1,320 yards from Papineau Island, being nearly in the middle of the bay.

Buoy.—A white barrel buoy, privately maintained, is moored close south of Curran Rock.

Jamieson Island is situated 150 yards northward of Papineau Island, and with it helps to form the west side of the approach to a shallow inlet known as Coursol Bay.

Lister Island, small, bushy, and 15 feet high, lies 150 yards from the east shore 1 mile northward of Papineau Island; a small rock with depth of 7 feet lies 150 yards westward of Lister Island.

Casgrain Rock, 3 feet high, lies over 590 yards westward from Lister Island and nearly 1 mile northeast of Curran Rock.

Beacon.—On Casgrain Rock is erected a beacon painted white.

Mount Victoria is a bare hill with three summits, the middle and highest of which is 482 feet high, and situated $2\frac{1}{2}$ miles northeastward of Cutler.

Bartlett Point.—From Cutler the northwest shore of Aird Bay trends in a general southwest by west direction $3\frac{1}{2}$ miles to Bartlett Point. On this shore are three slight projections known as Forwood, Ellis, and Ashmead Points, which may be approached to 200 yards. The latter is $1\frac{1}{2}$ miles northeastward of Bartlett Point and midway between them and 440 yards from the shore is a small rock 7 feet high. A rock with less than 6 feet on it lies 200 yards from the east side of Bartlett Point.

Hird Rock, awash, lies a little over 1,320 yards east by north from Bartlett Point and 440 yards southward from the dry rock 7 feet high above mentioned.

Directions.—During the survey in 1887 the steamer *Bayfield* used to enter Aird Bay from the west as follows:

From Nicholas Island a course 78° (E. $\frac{1}{2}$ N.), with Papineau Island and Gulnare Point ahead, was steered for $4\frac{1}{2}$ miles until the highest part of Mount Victoria was open southeast of Curran Rock, bearing 32° (NE. $\frac{1}{2}$ N.). This range led close southeast of Curran and Casgrain Rocks and northwest of the shoal ground about Lister Island and Rykert Point.

The line of the range beacon and freight shed, when discernible, bearing 19° (NNE. $\frac{1}{2}$ E.), is now the leading mark.

A vessel leaving the wharf may pass northwest of Casgrain and Curran Rocks, and southeast of Hird Rock, with not less than 4 fathoms at low stages, by keeping the wharf directly astern and Moiles Mills exactly ahead, bearing 223° (SW. $\frac{1}{2}$ W.).

The south sides of Aird and John Islands, with groups stretching southward and westward of them, will now be described:

Ferguson Islands are a group partially wooded, the largest and highest of which, 27 feet high, is situated 274° (W. $\frac{1}{2}$ N.) 1.6 miles from Boyd Island Lighthouse. With buoys, a vessel might pass between these islands and Aird Island, but the channel is so tortuous that the passage close to Boyd Island Lighthouse is far preferable.

A patch with 5 feet of water over it lies 1,320 yards from the highest Ferguson Island.

Rose Rocks, with 3 and 9 feet on them, respectively, lie southeast by south, and south a little over 590 yards from the highest Ferguson Island.

St. Paul Rock, with 15 feet, and a patch with 9 feet, south-southwest 1,175 yards, and southwest by south 440 yards, respectively, from the highest Ferguson Island.

Galbraith Point, on the south coast of Aird Island, is situated nearly 1 mile westward of the highest Ferguson Island, and lying off it are several rocky patches, none of which are very shallow. A spot, with 19 feet over it, is the shoalest and outer of these, and lies southward 1,320 yards from Galbraith Point.

Flint Rocks, bare and small, are situated with the southernmost one, 2 feet high, westward 1,320 yards from Galbraith Point.

Billa Rocks, a similar cluster, lie 440 yards farther west, the southern one, awash, bearing the same and distant 1 mile from Galbraith Point.

Lyon Island is the easternmost but one of a group extending from the middle portion of Aird Island nearly to Dalrymple Island distant $2\frac{1}{2}$ miles, the coast between Galbraith Point and Lyon Island at the back of Flint and Billa Rocks being broken up into a number of shallow bays. A rock, with 14 feet of water on it, lies south by

east rather over 440 yards from the southwestern extremity of Lyon Island.

Conmee Island, the next west and largest of the chain, about 40 feet high, lies a little over 440 yards westward of Lyon Island, and the same distance from the coast of Aird Island.

Ogilvie Island, the westernmost of the chain, lies nearly 1 mile northeast from Dalrymple Island, and a rock, with 6 feet of water on it, lies nearly 880 yards westward from it.

Fawcett Island, about the same size as the last mentioned, lies halfway between Conmee and Ogilvie Islands; and south of it 250 yards is a patch with 14 feet water over it.

Dalrymple Island is 65 feet high, slightly red in color, bare of trees, and stands well southward of any other island, circumstances which render it a good mark in the navigation of this part of the coast. It lies almost in the range passing through Clapperton Island Lighthouse and the northern extremities of Innes and Darch Islands, bearing 288° (WNW.) distant 13 miles from Clapperton Island Lighthouse and 96° (E. by S.) 10½ miles from Scott Island.

A patch with 17 feet on it lies east-southeast 440 yards from the eastern point of Dalrymple Island, and another, with 15 feet, lies north-northwest 350 yards distant from the same. A rock awash lies 50 yards south of the western end of the island, with which exception the south coast of the island is bold to, there being a depth of 10 fathoms at 100 yards. A bare rock, 5 feet high, is situated north by west 250 yards from the northwestern extremity of Dalrymple Island.

Mouse Island is perfectly bare, of a light brown color, 35 feet high, and derives its name from the quantity of mice that abounded on it at the time of the survey in 1887; it lies northwestward 1,175 yards from the northwest point of Dalrymple Island. A bank, the shoalest part of which has 2 feet over it, extends over 590 yards eastward from Mouse Island.

Bergin Rock, with 11 feet on it, lies southwest by west a little less than 1,175 yards from Mouse Island. A patch with 17 feet over it lies southwest by south over 590 yards, and another with 15 feet lies westward rather over 1,320 yards from Mouse Island. The space northward of Dalrymple and Mouse Islands is so occupied by rocks—dry, awash, and sunken—that a stranger should avoid it altogether.

Islands south of Aird Island.—**Innes Island**, situated about 4 miles southward of the eastern extremity of Aird Island, is 2.6 miles long in a northeast by north direction, with an average width of 1,175 yards, and about 30 feet high.

Royal Point, the northern extremity of this island, bears 287° (WNW.) and is 5 miles from Clapperton Island Lighthouse; it is flat off this point for 200 yards, where there is a depth of 15 feet.

Hesson Point is the next eastward of Royal Point, being distant therefrom 880 yards; the water is deep close to this point. The east side of Innes Island now trends southward nearly $1\frac{1}{4}$ miles to Landerkin Island.

Landerkin Island.—This is the largest of a group of small low islands, between which and Innes Island there is scarcely a passage for a boat.

A rock with 4 feet of water over it lies 440 yards southeast from the eastern extremity of Landerkin Island, in addition to which not more than 12 feet water will be found at a radius of the same distance from the same extremity.

Anchorage.—There is excellent anchorage between Hesson Point and Landerkin Island in 5 to 6 fathoms, over clay, where vessels will get good shelter in westerly gales by swinging no nearer the island than to keep Boyd Island Lighthouse in sight bearing 353° (N. $\frac{1}{4}$ W.).

Gavazzi Island, the eastern of two small low islets, is situated a little over 880 yards south-southwest of Landerkin Island and should receive a berth of 300 yards.

Kenny Point is the southwestern extremity of Innes Island, and from it a shoal reef named after the point extends in a west-southwest direction 590 yards, where there is only 8 feet of water. To lead 440 yards westward of this reef, keep Mount Victoria westward of or touching the northeast side of Darch Island, bearing 348° (N. $\frac{1}{4}$ W.).

From Kenny Point the south coast of Innes Island trends in an easterly direction, indented by several shallow coves, 1,320 yards, and should not be approached nearer than 590 yards.

Trow Point, on the west side of the island, is rather nearer to Royal than to Kenny Point, having on each side of it a shallow, stony cove.

Trow Point Shoal is a large rocky bank extending from the above point, there being but 11 feet at 1,175 yards, in addition to which a rock with 5 feet on it lies a little over 590 yards west-northwest from the same point.

Clearing mark.—To avoid this shoal keep the east end of Mount McBean open northwest of or in line with Royal Point, bearing 59° (NE. by E. $\frac{1}{4}$ E.).

Darch Island, situated about 2 miles westward of Innes Island, is 2.3 miles long northeast and southwest, $1\frac{1}{4}$ miles wide, and at its northern end about 50 feet high.

North Point of Darch Islands bears 288° (NW. by W. $\frac{1}{4}$ W.) and is a little over $2\frac{3}{4}$ miles from Royal Point, and the water is deep close to it.

Deep Point, on the east side of the island and $1\frac{1}{4}$ miles south by east from North Point, has the same character as well as the coast between them.

Stisted Island is a small stony islet at the southeastern extremity of Darch Island and 1 mile southwest by west from Deep Point, and should receive a berth of 440 yards.

Charlton Shoal, with 8 feet water over it, lies southwestward 1 mile from Stisted Island and the same distance east by north from the southern and smaller Howland Rock.

Clearing mark.—To pass southeastward of this shoal keep the east end of Mount McBean touching or over Royal Point, bearing 59° (NE. by E. $\frac{1}{2}$ E.).

Robitaille Point, the western extremity of Darch Island, is situated 1.6 miles northwest by west from Stisted Island, the coast between being foul to 880 yards.

Pinchgut Point, on the northwest side of Darch Island, is 1 mile northeast from Robitaille Point, and like the whole of the northwest side of Darch Island, is steep-to. Good limestone is quarried from the cliff near the shore in the vicinity of this point.

Crawford Island, 590 yards in length north-northeast and 5 feet high, is a wooded island over 590 yards south-southwestward of Robitaille Point, and the passage between is fit only for boats or small craft.

A **bank** with 8 feet on it lies 440 yards from the northwest coast of Crawford Island. A low island 100 yards in diameter lies 200 yards south of the island, from which a reef with 3 feet of water over it extends in a southwesterly direction a little over 590 yards.

Howland Rocks consist of two patches of gravel, the northern one being $3\frac{1}{4}$ feet high and the other 1 foot high (in 1887), situated 1,175 yards southward of the last-mentioned low island; shallow water extends 300 yards east and 440 yards westward of Howland Rocks.

St. Just Islands, 3 feet high, consist of two small islets joined by stones, situated nearly $1\frac{1}{4}$ miles southwest from Robitaille Point of Darch Island.

Belleau Island, 5 feet high and wooded, is over 590 yards long in an east and west direction by 440 yards in width, being nearly divided in three parts by as many coves. Shoal water extends in a northerly direction 300 yards from the east narrow point of the island, while a flat of 12 feet extends in the same direction and a similar distance from the northwestern extremity of Belleau Island. From its southwest part a bank extends over 440 yards in a south-southwest direction, at which distance there is a depth of only 3 feet.

Egg Island, 12 feet high, with a clump of elm timber in the middle of it in 1914, is the westernmost and smallest island of the group, and is connected to Belleau Island by a narrow rocky bank

on which there is a depth of 8 feet. A shoal extends 440 yards in a southeasterly direction from its south end, but the northern extremity may be approached to half that distance. From Egg Island a chain of rocky banks extends in a general 282° (WNW. $\frac{1}{2}$ W.) direction for nearly 3 miles, and between which it is not advisable for a stranger to attempt to pass. The principal dangers of this group, with their positions relative to Egg Island, are as follows:

Kaulbach Rock, with 14 feet on it, with its eastern end south-southeast a little over 880 yards.

Wallace Rock, with its eastern end, on which there is 9 feet, southwest by west 1,320 yards.

Labelle Reef, a large patch on which there is but 4 feet water, west by north a little over 1 mile.

Dalton Reef, with 1 foot water on it (in low stages it will be $2\frac{1}{2}$ feet above), on nearly the same bearing distant 2.2 miles.

Tyrwhitt Shoal, with a depth of 14 feet on it, 282° (WNW. $\frac{1}{2}$ W.), nearly 3 miles. Between this and Dalton Reef there exists another bank called Denison Rock, with 14 feet on it.

Rob Roy Patch, with 21 feet on it, 275° (W. $\frac{1}{3}$ N.), a little more than 3 miles.

Restless Bank, with least water of 26 feet, is $1\frac{1}{2}$ miles long by 1,175 yards wide, under a depth of 10 fathoms, the shoalest part bearing 269° (W. $\frac{3}{4}$ N.), distant $5\frac{1}{2}$ miles from Egg Island, is separated from Rob Roy Patch by a depth of 12 fathoms.

Clearing mark.—Mount Victoria in range with Mouse Island bearing 28° (NE. by N.) leads westward of all the dangerous shoals above mentioned, and between them and Restless Bank.

Caution.—A sailing vessel tacking, or a steamer in thick weather, will get good indication of her approach to the south side of these reefs by the 10-fathom curve, which keeps from these dangers an average distance of 880 yards, excepting abreast of Wallace and Howland Rocks it approaches to within 440 yards. But the north side of these reefs go down like a wall into little less than the deepest water between them and Aird Island. The soundings on that side are therefore no guide.

Directions.—A good channel with depth of 5 fathoms exists between St. Just and Belleau Islands, to take which from the southwest bring Pinchgut Point midway between St. Just and Belleau Islands, bearing 45° (NE. $\frac{1}{2}$ E.), and proceed so through the channel until the west fall of Janet Head touches the western extremity of St. Just Islands, bearing 197° (SSW.), when haul northward on this clearing mark to pass westward of the bank from Crawford Island.

If taking this channel from the northeast, bring the west fall of Janet Head midway between St. Just and Belleau Islands, bearing

196° (S. by W. $\frac{1}{2}$ W.). When south of the islands and bound westward, keep Pinchgut Point midway between St. Just and Belleau Islands, bearing 44° (N. E. $\frac{3}{4}$ E.), astern until the depth of 10 fathoms is reached. If bound eastward, keep the eastern extremities of Dalrymple and Belleau Islands touching, and bearing 333° (N. by W. $\frac{1}{2}$ W.), until the same depth is reached.

Clapperton Island Lighthouse to Gore Bay.—The course from a position 880 yards 310° (NW.) from the lighthouse to a position 1.3 miles 36° (NE $\frac{3}{4}$ N.) from Gore Bay Lighthouse is 237° (SW. by W. $\frac{1}{2}$ W.) and distance 12 $\frac{1}{2}$ miles. As this course leads a little less than 880 yards northwest of Western Reef off Clapperton Channel, care must be taken before arriving in the locality to have Clapperton Island Lighthouse in the hollow of the hills at Fort La Cloche, bearing 60° (NE by E. $\frac{3}{4}$ E.). Having arrived at the above position off the entrance to Gore Bay, a course 172° (S. $\frac{1}{4}$ E.) for 2 $\frac{1}{4}$ miles will take a vessel to Town Point.

From Gore Bay to Little Detroit steer from the above position off the entrance 31° (NE. $\frac{3}{4}$ N.) for 12 miles, passing between Innes and Darch Islands to a position 1 $\frac{1}{4}$ miles from Boyd Island Lighthouse in range with the western Hiesordt Rock bearing 353° (N. $\frac{1}{4}$ E.), whence proceed as directed.

Beaufort Island, low and wooded, lies near the southeastern extremity of John Island, being separated therefrom by a boat channel 200 yards wide. A bank under the depth of 21 feet extends 440 yards from the east side of this and John Island.

Beaufort Reef is a group of stones 2 feet high lying on the southern termination of this bank 350 yards south of Beaufort Island, and from the east side of these boulders a reef with 4 feet on it extends 350 yards; the south side of the stones may be approached to 300 yards. A shallow sand bank extends from Beaufort Island to East Entrance to Moiles Harbor.

This shoal bank round Beaufort Island continues westward; a spot with 2 feet water on it lies west-southwest a little more than 590 yards, while another with 5 feet on it lies west by north a little more than 880 yards from the western extremity of Beaufort Island. The latter spot also lies 440 yards south-southeast from Tern Island.

Tern Island.—This rather conspicuous dark-colored islet, 17 feet high, lies west-northwest nearly 1,320 yards from the western extremity of Beaufort Island, and is bold to on its south, southwest, and northwest sides.

Fisher Island, low and thickly wooded, is situated a little over 440 yards northward of Tern Island, and 260 yards southwest from the former is situated a small rock 2 feet high and 350 yards from the main coast of John Island.

The south coast of John Island, from Fisher Island, assumes a smoother character, running in a westerly direction nearly straight for $1\frac{1}{4}$ miles with deep water off it to the eastern entrance to John Harbor.

John Harbor.—The north side of this excellent haven is formed by the southwest coast of John Island, while it is sheltered on the south by a narrow island a little over 2 miles long called Dewdney Island.

Harbor Island, small and 3 feet high, lies 300 yards eastward of Dewdney Island, being connected therewith by a reef over which not more than 6 feet can be carried. The eastern entrance to the harbor is northeastward of Harbor Island and has a depth of 14 feet (in low stages there may be $3\frac{1}{2}$ feet less).

Sandy Point is the first projection of John Island after passing westward of Harbor Island; to and from this point a sand spit extends two-thirds the way across to Dewdney Island, leaving near the latter a channel with the depth above mentioned. A little over 880 yards northwest by west from Sandy Point is a small green point on John Island, close to which is a depth of 4 fathoms; and the bight between these two points should not be approached nearer than 100 yards. From this green point the coast of John Island runs in the same direction nearly straight to the narrows separating John Island from Gowan Island.

Gowan Island.—This island is almost denuded of trees, and its south point narrows the west entrance to the harbor to 220 yards, when, by keeping rather nearer to Dewdney than to Gowan Island, a depth of 22 feet can be obtained; a rock awash lies 70 yards off the western extremity of Gowan Island. A rock, with 14 feet over it, is situated 350 yards from the same extremity and 200 yards from Dewdney Island.

Dewdney Island.—Close to the harbor side of this island and 350 yards west from the eastern extremity lies a small round rock, 1 foot above the water, known as Pancake Rock, 70 yards northwest of which and 50 yards offshore is a rock with less than 6 feet over it. Three-fourths of a mile west from the eastern extremity, the harbor coast of Dewdney Island turns southwestward, forming a cove 250 yards deep with two islands and a cluster of dry rocks lying across the mouth. From the eastern point of the larger island a reef extends in an east-northeast direction 250 yards, at which distance there is a depth of 10 feet, leaving a channel 4 fathoms deep and 150 yards wide between it and the green point previously described. To pass north-east of this reef, keep the north side of Harbor Island touching Sandy Point, bearing about 124° (SE. $\frac{1}{2}$ E.).

Anchorage.—A vessel may anchor in 4 fathoms, mud bottom, east ward of this reef, or in 5 fathoms westward of the same, or northward of the cove in Dewdney Island just mentioned.

From the latter cove the north coast of this island runs westward straight 1 mile to the west end, which is surmounted by a bare summit 67 feet high. This extremity of the island is 300 yards from Le Sueur Island, and midway between them is a small islet with a cluster of dry rocks on its south and east sides, the highest and southernmost of which attains a height of 22 feet. A depth of 8 feet can be carried between this cluster and Dewdney Island and 7 feet between it and Le Sueur Island.

Dewdney Rock, with 3 feet water over it, is a dangerous obstruction, situated 1,175 yards from the nearest part of Dewdney Island and southwest by west from its eastern extremity. A rock with 11 feet on it lies 880 yards southwest from the same extremity.

Directions.—If from the southeast, a vessel may carry 14 feet into this harbor by keeping midway between Harbor Island and the John Island shore. Having passed the former, haul over for the eastern extremity of Dewdney Island, steaming slowly and with the lead going keep 50 yards or less from this island until up to Pancake Rock, when the shallow spit extending from Sandy Point of John Island will be passed. Steer now for the little green point on the latter island, taking care as it is approached to keep the north side of Harbor Island touching or closed with Sandy Point, bearing about 124° (SE. $\frac{1}{2}$ E.) in order to clear the 10-foot reef extending north-eastward from the east point of the cove in Dewdney Island.

Pass 100 yards off the green point and then borrow toward Dewdney Island until in mid-channel, when a vessel may anchor in 5 fathoms, mud bottom, or proceed through into Whalesback Channel by keeping midway between the islands on a course parallel to the north coast of Dewdney Island until the south point of Gowan Island is reached, when a mud bank extends halfway to the former, but over which outside of 50 yards from Gowan Island there is not less than 3 fathoms. A vessel may now haul out into Whalesback Channel between Le Sueur and Gowan Islands.

Acadia Rock, with 13 feet on it, lies 1,175 yards southwest by south from the eastern extremity of Alfred Island.

Rescue Rock is a dangerous ledge just covered (in low stages it would be 3 feet above the surface), lying 590 yards southward of the line joining Dalrymple Island and Black Rock. It bears 154° (S. by E. $\frac{1}{4}$ E.) and is $1\frac{1}{2}$ miles from the southwestern extremity of Scott Island; the water is shoal for 100 yards east of the rock and a depth of 5 fathoms will be found 200 yards westward, with which

exceptions deep water approaches close to the rock, especially on the south and southeast sides; therefore great caution is necessary when near it in thick weather.

Gunboat Shoal, with 8 feet least water upon it, is 590 yards long east and west by 150 yards broad. The shoalest part is the middle of the bank and is distant 1,175 yards west by north from the southwestern extremity of Scott Island and nearly 880 yards south by west from the western Minstrel Rock.

Clearing mark.—To pass west of this shoal keep the west side of Round Island touching the east side of Turnbull Island, bearing 344° (N. by W.).

Clara Island.—Southward of Algoma Mills is situated a large group of islands of varied size, the eastern called Bassett and Turnbull and the central and largest one known as Clara Island, which is partially wooded, about 50 feet high, and $1\frac{1}{4}$ miles in length east and west, with maximum breadth of 880 yards; the north coast of Clara Island should receive a berth of 250 yards.

Loughlin Island, with a conical summit 58 feet high, is the southwest island of the group and situated 1 mile northward from Black Rock. A rock with 8 feet water on it lies 440 yards westward from the north point of Loughlin Island.

Struthers Island, about 30 feet high, lies nearly 1,175 yards north by east from Loughlin Island, its northeast, southeast, and southwest points being foul for 150 yards.

Jane Rock, 12 feet high, lies west by south a little over 1,175 yards from Struthers Island, and midway between the southwest point of the latter and Jane Rock is a patch with 7 feet water on it.

Doucet Rock, 10 feet high, is situated nearly 1 mile westward from Struthers Island and 440 yards southeast of the fairway leading mark through South Passage.

Bruce Rock, with 5 feet water on it, lies 440 yards northwest from the northwestern extremity of Struthers Island, and 590 yards west of Bruce Rock is a patch with $3\frac{1}{2}$ fathoms water on it.

Clearing mark.—The south side of Round Island touching the north side of McCallum Islands, bearing 70° (ENE. $\frac{1}{4}$ E.), leads northwest of Bruce Rock; the lower rocks belonging to the latter will be a little overlapped with Round Island.

Caroline Island, about 60 feet high, 880 yards long northwest and southeast, with a breadth of 440 yards, lies 1,175 yards eastward from Loughlin Island.

As there is no passage to be recommended to a stranger through the islands between Turnbull and South Passage they are unimportant in comparison with the southern chain of high bare rocks and their attendant dangers, of which the most easterly is Cherub Rock.

Cherub Rock.—This little rock, 3 feet high, is situated southwest by west a little over 1,320 yards from the southeastern extremity of Turnbull Island. A patch with 3 fathoms and another with 17 feet lie east by north 880 yards and 300 yards, respectively, from Cherub Rock.

A rock with 14 feet on it, lies 350 yards west-northwest from the same, while to the south a depth of 10 fathoms will be found 300 yards distant.

Huntly Rock, with 4 feet on it, is situated at the western extremity of a reef with less than 12 feet 590 yards long, the eastern end with 9 feet lying a little over 590 yards westward from Cherub Rock; a depth of 10 fathoms will be found 300 yards southward of this reef.

Fortin Rocks consist of four, the southern of which is 1 foot above the water; the northeastern one about 30 feet high with a few tall trees on it, lies 440 yards northeast from the southern one and southeast by east a little over 590 yards from the southeastern extremity of Caroline Island. A rock with 8 feet water over it lies 170 yards southward of the southern Fortin Rock, falling suddenly down to a depth of 17 fathoms.

Ramsey Islands, three in number, lie 880 yards north by east from Fortin Rocks; 250 yards southward of the east Ramsey Island is a rock with 9 feet water on it, while 440 yards south by west from the western islet will be found the western extremity of a reef with depth of 5 feet.

Chrysler Rocks consist of a string nearly 880 yards long northeast and southwest, the northeastern rock 16 feet high being the largest and highest. The southwestern rock is situated 880 yards eastward from Black Rock.

Black Rock is, properly speaking, composed of three small rocks, the highest being 12 feet high, and situated $15\frac{1}{4}$ miles 270° (W. $\frac{1}{2}$ N.) from the southwest point of Dalrymple Island. With the exception of the next-mentioned danger, the water is good all around, the 10-fathom curve reaching to within 75 yards on the south and 150 yards on the northwestern side. A rock with 13 feet water on it lies east by north 300 yards from Black Rock.

Michels Ground is a patch with $4\frac{1}{2}$ fathoms on it situated nearly 1,175 yards south by west from Black Rock, and between them the depth is over 20 fathoms.

The Cousins are two flat islands each 5 feet high and lying southeast by east and northwest by west distant 300 yards from each other. The northwestern island bears 156° (S. by E. $\frac{3}{4}$ E.) and is $2\frac{1}{2}$ miles from Black Rock. They are connected with each other by, and surrounded with, shoal water, there being only 10 feet 350 yards

westward of the northwest island, while a rock with less than 6 feet on it lies 300 yards northeastward from the northwestern extremity of the same. Shoal rocks lie 300 yards southwest and south from the southeast Cousin.

Europa Reef, with 9 feet on it (in low stages there may be $3\frac{1}{2}$ feet less) is situated 90° (E. $\frac{1}{2}$ S.) a little more than $1\frac{1}{2}$ miles from the southeast Cousin, while 590 yards northeastward from the 9-foot spot is another patch—part of the same bank—with 13 feet on it. A depth of 15 fathoms will be found between The Cousins and Europa Reef, and the same between the latter and a bank with 23 feet water on it, bearing 80° (E. $\frac{1}{2}$ N.) distant $3\frac{1}{2}$ miles from the southeast Cousin Island and known as Maitland Patch.

Drew Island is small and 23 feet high, being the northwestern one of a group lying northwestward of Long Point and nearly 880 yards north-northwest therefrom. Drew Island may be approached from the west to 200 yards.

Navy Island, 250 yards long northeast and southwest, and quite narrow, lies a little over 590 yards from Drew Island, and may be approached to 200 yards.

Cook Island, small, wooded, and about 25 feet high, is situated nearly 880 yards northeast by east from Navy Island and like the latter, it is the outlying one of several islands lying off this part of the coast; the water is deep 200 yards west of it.

Garibaldi Island, 13 feet high and steep-to, is the northeastern one of the group, and is separated by a boat channel 100 yards wide from the peninsula on which is situated an Indian village.

Emerald Point, on the south shore, lies northeast by east nearly 1,175 yards from Garibaldi Island, and is bold-to; near the shore of the cove south of the point is situated an Indian burial ground. This point may be considered as the south entrance point of Serpent Harbor.

Serpent Harbor.—This inlet from Emerald Point runs in a general east by north direction $2\frac{1}{2}$ miles to the mouth of Serpent River, farther than which the survey was not taken, but to which distance vessels drawing not more than 7 feet water can proceed. The inlet has an average breadth of 880 yards. McFadden and Malloy have a saw mill here, and there is frequent communication by steamer with the principal North Channel and Georgian Bay ports. The village called Spragge having a population in 1911 of about 400, is a station on the Sault Ste. Marie branch of the Canadian Pacific Railroad. At 590 yards above the mill the depth of the harbor diminishes to less than 18 feet and at $1\frac{1}{2}$ miles from the same there is not more than 12 feet.

Customs.—There is no official here, but one resides both in Cutler and Blind River.

Nobles Island, rising to a height of 140 feet and 1,320 yards long, lies across the mouth of the harbor, leaving a good channel north of it by which 14½ feet water can be carried to the western wharf at low stages.

Narrow Point is the long, sharp northwest point of Nobles Island, and a vessel entering the harbor may keep the point close on board, there being 4 fathoms water 50 feet off it.

Meteor Rock, 15½ feet in height, is a small round rock lying 440 yards west-southwest from Narrow Point of Nobles Island, and is a good mark of recognition for the entrance to Serpent Harbor. In 1887 a small light was kept burning on the rock at night by the inhabitants of the port. Up to that date masters of vessels had been in the habit of passing north of Meteor Rock, by which track they can carry only 13 feet water (in low stages there may be 3½ feet less), the greatest depth on the bank connecting the rock with Hospital Point, so called from it being the temporary site of a camp for the isolation of typhoid-fever patients during an outbreak in the summer of the above year.

The southeastern extremity of the shoalest part of this mud bank extends 170 yards from the eastern part of Hospital Point and is distant 350 yards northeast from Meteor Rock, where there is only 4½ feet water. The deeper channel, however, is southward of Meteor Rock and between it and Cross Island.

Cross Island, so called because it lies athwart the channel into the harbor, the water being just as good between it and Nobles Island as between it and Meteor Rock, the more direct passage, and therefore the one recommended. This island, 31 feet high, 170 yards long east and west, and 50 yards broad, leaves a channel with 23 feet of water, 125 yards in width, between it and Meteor Rock Bank, and also a passage with the same depth 100 yards broad between its eastern end and Nobles Island; but the latter has a sharp turn, awkward for a long vessel. The east and south sides of Cross Island are steep-to, while from the western extremity it is shallow for 50 feet, and on the north side shoal water extends 50 yards.

Morrison Islands, two in number, lie at the eastern extremity of Nobles Island, with a boat channel between, the eastern one being steep-to.

Indian Island, so called from the Indians using it as a summer camping ground, is small, 13 feet in height, and lies in the middle of the bight on the north side of Nobles Island.

Anchorage in 15 to 16 feet of mud may be had between Indian Island and the eastern shore of the bight.

Smith Island, 38 feet high, lies 440 yards east by south from Morrison Islands and is separated from the south shore of the harbor

by a boat channel 40 yards wide; a vessel will find anchorage in 20 feet over mud between this and Nobles Island. The entrance to Serpent Harbor, south of Nobles Island, is situated a little less than 1,175 yards eastward of Emerald Point. Here the channel is narrowed by a reef 3 feet high lying close to the main shore to a width of 100 yards, in the middle of which lies a rock with not less than 11 feet water on it, so that, as previously stated, a vessel drawing not more than 10 feet could safely pass through at that time.

The coast line is cliffy, rising to a height of 138 feet, and just east of the rocks at the narrows is a cove 200 yards deep with rushes at the bottom; the coast then becomes cliffy again and 134 feet high till 250 yards eastward of the eastern entrance to the channel, between which position and Smith Island the shore is composed of two shallow bays.

Snider Island, 60 feet in height, is a conspicuous conical island 300 yards northeastward of Smith Island and east by south 1,320 yards from the mill. It is connected by shallow sunken rocks to a smaller islet, 15 feet high, 60 yards east of it, and a boat passage exists between both islands and the south shore.

McCracken Island, 100 yards long by 50 yards broad, lies 200 yards northeast from Snider Island. Between the east end of the latter and the middle of McCracken Island, and rather nearer to the former, lies a rock with 5 feet water over it. The ship's passage is between the rock and McCracken Island, and the rock may be avoided by keeping a point 2 miles westward of the entrance to the harbor (recognizable by its high pines) open north of, or touching, Narrow Point of Nobles Island.

Spragge Island, 100 yards from the south shore, is 30 feet high and lies 440 yards east-southeast of Snider Island. There is depth of 14 feet abreast of this island, the coast between it and the mouth of the river being broken up into several coves.

Hamilton Rock, with 5 feet of water on it, lying in the middle of the inlet, is situated nearly 880 yards eastward from McCracken Island.

From the mouth of Serpent River the north shore of the harbor trends first in a northwesterly direction 440 yards, whence it runs with a succession of slight bights and points to the mill and wharves situated 880 yards east-northeast from Narrow Point. At the western of these there is a depth of 17 feet at low stages.

Fournier Islands, two in number, the western one being 82 and the other 48 feet high, lie westward a little over 590 yards from Meteor Rock, and their south sides are steep-to.

Strong Island, lying 350 yards off this shore and the same distance westward of Fournier Islands, is about 50 feet high, with a rock detached from the western extremity, and, like the last mentioned,

has deep water close to its south side. A passage with 17 feet exists between these islands and the shore by keeping nearer the former, which would make a good protection to any wharves that might be built in the future.

Chicora Island is over 2 miles westward of Strong Island, and lies quite close to the coast, about 100 feet high, which, between Strong and Chicora Islands, may be approached to 200 yards.

Mitchell Islands, lying parallel to the shore, 590 yards in length and narrow, is situated with its western point $1\frac{1}{2}$ miles westward from Chicora Island. The space between Mitchell Island and the shore, 440 yards broad, has a depth of 14 to 17 feet over mud, and would offer shelter to vessels or wharves. Rocks with 3 feet over them lie east by north a little over 440 yards from the eastern extremity of Mitchell Island and 300 yards offshore.

Shickluna Rock, with 6 feet water over it, lies south-southwest 300 yards from the other end of the island.

Magazine Island, small and bare, with some large blocks of stone on the top, and about 20 feet high, lies 880 yards southward of Mitchell Island and $1\frac{1}{2}$ miles east by south from the wharf at Algoma Mills. A rock 6 feet high lies 170 yards east-northeast from Magazine Island, good water existing all round this island and rock.

In the passage between Mitchell and Magazine Islands the depths vary from 18 feet near the former to 30 feet on the latter side, and in using this channel care must be taken to avoid Shickluna Rock by keeping nearer Magazine Island.

Round Island is situated a little more than 1,320 yards north by east from Bassett Island, and the same distance east-southeast from Magazine Island. It is about 150 feet high, thinly wooded, cliffy on the west side, and of about the same size and appearance as Scott Island. A rock with 5 feet water on it lies 200 yards eastward of the southeastern extremity, and a rock 24 feet high lies 60 yards off the southwest side.

McCallum Islands consist of a group of low islands and rocks, the western and longest of which, 200 yards long east and west and 70 yards broad, lies a little more than 1,175 yards northwest from the east end of Bassett Island. A rock with less than 6 feet water over it, together with a patch of 12 feet lying 150 yards still farther east, narrow the channel between McCallum Islands and the rocks 24 feet high near Round Island above mentioned to 300 yards, in which, however, there is a depth of 4 to 5 fathoms, by keeping rather nearer to this rock. A rock awash lies 70 yards from the southwestern extremity of the west McCallum Island. A good channel with 5 fathoms water and 1,175 yards in breadth will be found between McCallum and Bassett Islands.

East Bay is an indentation immediately eastward of Algoma Mills, in which a vessel will find shelter in westerly gales in 14 to 15 feet (in low stages there may be $3\frac{1}{2}$ feet less) over sand and mud.

Algoma Mills, in the township of Long, is the site of a sawmill driven by a stream emptying out of Lake Lauzon, and owned by the Canadian Pacific Railroad Co., which also has one of its stations here on its Sault Ste. Marie branch. A considerable quantity of coal is landed here for the railroad. A substantial wharf 800 feet long extends from the mouth of the river to a depth of 14 feet, but at low stages there may be $3\frac{1}{2}$ feet less; the village, with a population of about 120, has post, telephone, and telegraph offices and possesses a hotel. The village is situated in a bay, separated by a level broad point covered with young timber from East Bay.

Lally Point, nearly $1\frac{1}{2}$ miles west-southwest of Algoma Mills, partially shelters the wharf at the latter, notwithstanding which in heavy westerly breezes considerable swell is felt on its weather side.

Sanford Island, wooded and about 30 feet high, is situated a little over 1,320 yards southward of Lally Point; the island is 880 yards long northeast and southwest by 440 yards in breadth, and is connected to Lally Point by a bar of sand, on which the deepest water, 18 feet, is 150 yards from Sanford Island. At a third of the distance from Sanford Island to Lally Island there is 16 feet, and in the middle of the passage only 15 feet of water (in low stages there may be $3\frac{1}{2}$ feet less).

Ploughboy Rock, with 9 feet water on it, lies 1,175 yards east by north from the northeastern extremity of Sanford Island, to pass east of which keep the wharf of Algoma Mills end on, bearing 4° (N. $\frac{3}{4}$ E.). A depth of 14 feet will be found on the sand bank connecting Ploughboy Rock to Sanford Island.

Spartan Rock, with 15 feet water on it, lies $1\frac{1}{2}$ miles 77° (E. $\frac{3}{4}$ N.) from the northeast point of Sanford Island, and 148° (SSE. $\frac{3}{4}$ E.) a little more than 1 mile from Algoma Mills Wharf.

O'Dwyer Island, small and low, lies 440 yards westward of Sanford Island, the channel between them being rendered unfit for large vessels by reason of a rock in the middle with 9 feet water on it. A passage exists on the north and south sides of O'Dwyer and Sanford Islands, the former being known as North and the other as South Passage.

Pandora Rock, with 8 feet on it, is situated a little over 590 yards westward from O'Dwyer Island, and to insure passing north of it keep the north sides of Round and Sanford Islands touching and bearing 79° (E. $\frac{1}{2}$ N.).

Isaac Rock, with 12 feet over it, lies west-southwestward, 1,175 yards from O'Dwyer Island.

May Reef, with the same depth on it, lies in the same direction, $1\frac{1}{2}$ miles from O'Dwyer Island.

A rock with bowlders on top and having a least depth of $6\frac{1}{2}$ feet of water lies 300 yards east of May Reef or $1\frac{1}{4}$ miles 238° (SW. by W. $\frac{1}{2}$ W.) from the southwest point of Sanford Island.

Simon Rock, small, bare, and $1\frac{1}{2}$ feet above the water, is the westernmost of the rocks and islands forming the large group of Algoma Mills and lies $1\frac{1}{2}$ miles southwest by west from O'Dwyer Island. Shoal water extends 70 yards from the south end of the rock, with which exception nothing of a very shallow character could be found in its locality. A sandy knoll with 17 feet over it lies east by north nearly 880 yards from Simon Rock.

Southwest Patches, having 18 and 8 feet upon them, lie south-southwest 880 yards and 590 yards, respectively, from Simon Rock.

Note.—The height of Simon Rock was measured with extra care as a reference mark for the depths taken during the survey in 1887–1888. At the low water of 1895 the top of the rock would be 5 feet above the water.

Directions.—Bound from Little Detroit to Algoma Mills, follow the directions for Whalesback Channel as far as Bassett Island. Pass 150 yards northward of the latter and when the houses and wharf at the mills are in sight southwest of McCallum Islands they may be steered for, giving the latter a berth of 200 yards. Passing which keep sufficiently eastward, if of heavy draft, to avoid Spartan Rock.

If for Serpent Harbor, follow the directions for Whalesback Channel and when well westward of La France Rock haul northward until abreast of Navy Island, whence proceed midway between the islands on each side. Pass 50 yards south of Meteor Rock, the same distance west of Cross Island, north of Narrow Point, and midway between the wharves and Nobles Island until up to the former, or a vessel may anchor 200 yards east-northeast of Indian Island. The least water passed through will be 18 feet, but in low stages there may be $3\frac{1}{2}$ feet less.

From Boyd Island Lighthouse westward.—If bound to Mississagi Strait, a vessel on the leading mark to McBean Channel and $1\frac{1}{4}$ miles southward of the lighthouse should steer 264° (W. $\frac{1}{4}$ S.) for $7\frac{1}{4}$ miles to a position 1 mile 175° (S.) from Dalrymple Island. Then to a position 440 yards northwest of the western part of Meldrum Point; the course is 254° (W. by S.) and distance $33\frac{1}{2}$ miles.

If bound to St. Joseph Channel and Sault Ste. Marie, a stranger should pass south of the Cousins, the course from the above position south of Dalrymple Island to 1 mile 175° (S.) from the southeast Cousin being 261° (W. $\frac{1}{4}$ S.) and distance 15.6 miles.

If taking Scott passage from the south, Rescue Rock, awash, is an awkward obstruction, and before getting nearer to Scott Island than 2 miles care should be taken that the west side of Round Island is not in sight southwest of Scott Island, as the southwestern extremities of both islands in range bearing 326° (NNW. $\frac{1}{2}$ W.) lead close northeastward of the rock. Pass between Scott and Mills Islands, northeast of Peter Islands and Robb Rocks, and southwest of Sylvain Island, and thence as directed.

Turnbull Passage.—In taking this passage from the south approach with the west side of Round Island touching the east side of Turnbull Island, bearing 344° (N. by W.). This mark, if distinguishable at this distance, leads $1\frac{1}{4}$ miles westward of Rescue Rock and 590 yards on the same side of Gunboat Shoal. Keep 880 yards east of Turnbull Island, when proceed as directed.

South Passage.—If proceeding to Serpent Harbor or Algoma Mills by this passage, before shoaling to less than 10 fathoms, see that the inner and north end of Algoma Mills wharf is in range with the northwest side of Sandford Island, bearing 38° (NE. $\frac{1}{2}$ N.). Steer for them so, passing rather nearer Doucet than Simon Rock until the south side of Round Island is in range with the north side of McCallum Islands, the low rocks of the latter will overlap the coast of the former, bearing 70° (ENE. $\frac{1}{2}$ E.). Keep on this range, passing 200 yards north of these islands, and thence in mid-channel for Serpent Harbor.

If for Algoma Mills, as soon as the wharf at the latter is seen on end, bearing 4° (N. $\frac{1}{4}$ E.), it may be steered for which will lead between Ploughboy and Spartan Rocks.

North Passage.—Before Comb Point (Blind River) bears west of 355° (N.), the north sides of Round and Sandford Islands should be brought in range, bearing 79° (E. $\frac{1}{2}$ N.), which range will keep a vessel off the extensive sand flats fronting the shore from Comb to Lally Point. This mark will also lead to the north side of Sandford Island in 17 feet water (in low stages there may be $3\frac{1}{2}$ feet less).

Pass 200 yards north of the latter and head for Magazine Island, passing 300 yards north of Ploughboy and 440 yards on the same side of Spartan Rock. Leave Magazine Island 200 yards on either hand and steer so as to pass that distance south of Strong and Fournier Islands, when enter Serpent Harbor as directed. If for Algoma Mills, the wharf may be steered for when end on.

Double Island consists of two small, low islets, the western of which is almost bare and 12 feet high; they lie 1.3 miles westward from Lally Point and 1,175 yards off the shore of the bight between the latter and Mary Point. In the eastern portion of the bight are three islets, the western being known as Dot, the eastern as Plumb,

and the northern as Can Island. Between the former and Double Island the extensive sandy flat has a depth over it of 10 feet.

Mary Point is situated nearly $2\frac{1}{4}$ miles west from Lally Point and terminates the bight above mentioned.

Moodie Rock, just showing, lies west-southwest 300 yards from Mary Point.

Caribou Point is a small hooked peninsula situated southeast by east a little over 1,320 yards from Blind River, and west by north 2.6 miles from Mary Point.

Louis Island, 3 feet high, with a few trees on it, and the eastern one of a small group of rocks, lies 350 yards from Caribou Point; the western rock is 6 feet high and lies 150 yards southward of the point.

Davies Rock, 5 feet high, lies east by north 1,175 yards from Caribou Point and 300 yards off the shore of Hoffman Bight, as the indentation between Colin Cove and Caribou Point is called.

Dixie Rock, $\frac{1}{2}$ foot high, lies nearly 880 yards southeast from the same. A rock awash is situated 70 yards northwestward of Dixie Rock. Halfway between Caribou Point and the wharf there is a low islet called Henriette Island.

Blind River.—The mouth of this small river—called by the Indians Penewabekung—is situated 7 miles westward of Algoma Mills. The burner and large smokestack of a sawmill burned down a few years ago are situated near the mouth of the river. It is a station of the Sault Ste. Marie branch of the Canadian Pacific Railroad.

Wharves.—These consist of a Government wharf 550 feet long and 230 feet broad at the outer end, with depth of 18 feet. From the mouth of the river project two iron skeleton tramway piers, alongside which vessels used to load when the old mill was standing. These conspicuous piers run first a little westward of south for 440 yards, and then one of them runs the same distance east-southeast. Southwestward 350 yards from the outer end of the Government wharf is the outer end of Eddy's eastern lumber loading wharf, which with the other close to it, extend over 440 yards from the shore.

Customs.—Blind River is an outpost of entry.

Range Lights—Front Light.—A fixed red light, 25 feet above water, visible 6 miles, is shown from the corner of a drab storehouse on the outer end of the Government wharf at Harriette Point.

Bear Light.—A fixed red light, 40 feet above water, visible 7 miles, is shown from a mast 517 yards 31° (NE. $\frac{3}{4}$ N.) from the front light. These lights in range lead to the Government wharf from the Eddy wharf range.

The back day mark is difficult to see, but the outer corner of the Government wharf in line with the old burner makes the same lead.

Eddy Wharf—Front Light.—A fixed red light, 35 feet above water, visible 7 miles, is shown from a mast on the elevated way west Eddy West wharf.

Rear Light.—A fixed red light, 50 feet above water, visible 7 miles, is shown from a lantern on an office building 98 yards 3° (N. $\frac{1}{4}$ E.) from the front light.

These lights in range lead through the dredged channel to Eddys wharves.

If these poles can not be seen, the western of the two Eddy wharves kept end on affords the same lead.

Susanne Island.—This small, bare island, 8 feet high, lies 880 yards eastward from Comb Point. A rock awash lies 150 yards eastward from the island, while sunken rocks lie off the west and northwest sides a distance of 100 yards.

Clearing mark.—Mary Point in range with Louis Island bearing 92° (E. $\frac{3}{4}$ S.) leads north of these rocks.

Comb Point, the eastern extremity of the island separated from the mainland by Dorothy Inlet, is situated nearly 1 mile southwest of the mouth of Blind River and shelters the wharves from the west. A rock awash lies 150 yards southeastward from its extremity.

Belle Rock, with 8 feet over it, lies nearly 880 yards south from Susanne Island, and to pass south of it keep the whole of Double Island shut in north of Lally Point, the latter bearing 81° (E. $\frac{1}{4}$ N.).

Buoy.—A black and white striped barrel buoy marks Belle Rock.

Blind River Bank is the extensive flat, with depths from 12 to 18 feet (in low stages there may be $3\frac{1}{2}$ feet less), which extends in the vicinity of Blind River nearly $2\frac{1}{2}$ miles.

Directions.—The approach to the wharves at Blind River is by a channel 150 feet wide, dredged to a depth of 15 feet at low stages and marked in 1914 by two black and three red spar buoys. The outer two, opposite each other, lie 880 yards south-southeast from Comb Point, the channel passing 200 yards from the latter. The proximity of this point, together with the prevailing on-shore winds, render the approach by no means inviting to a stranger, who is advised to seek local assistance.

Having picked up the outer buoys, proceed on the Eddy wharf range until about 70 yards from the wharf, whence steer on the Government wharf range. A vessel should check down, just keeping steerage way.

Patrick Point is situated westward 2 miles from Comb Point, and a little over 590 yards east of Patrick Point is the western entrance (with the remains of a little wharf) to Dorothy Inlet, between which and Comb Point three small coves indent the coast. Midway between the middle and eastern of these boat coves and 1,175 yards west of Comb Point a reef extends 150 yards.

Mississagi River.—The bay into which this river empties itself is contained between Patrick Point on the east and Wolstan Point 1 mile westward of it, the mouth of the river being nearer to and 590 yards northwest from Patrick Point. The river trends north-west by north $1\frac{1}{2}$ miles, with a depth of over 8 feet, when another channel leaves the main river and empties into Mississagi Bay, with a depth of 4 feet on the bar, the two mouths inclosing a delta of several low islands. At the convergence of these two principal mouths is situated a trading post and a small village of Indians and others. The Canadian Pacific Railroad crosses the river 440 yards above the fork.

Patrick Point Bank commences at Wolstan Point, whence it extends 300 yards, and stretches across the bay into which the river flows, forming a bar over which not more than 8 feet can be carried into Mississagi River. The southeastern extremity of the bank, with a depth of 8 feet, extends over 1,320 yards south-southeast from Patrick Point; a vessel should therefore give this point a wide berth.

Beaumont Point is the next west of Wolstan Point, being distant therefrom a little over 1 mile, and between, the shore takes the form of a sandy beach.

Webber Island, the western extremity of the delta of Mississagi River, is about 20 feet high, and between it and Beaumont Point is a shallow, sandy cove with a small islet in the middle. A small wooded island lies 170 yards from the southwest point of Webber Island, being connected thereto by a narrow bank of dry stones.

Mississagi Bay takes its shape from a chain of islands extending from Webber Island, just mentioned, a little more than 5 miles, called by some the French Islands; but, as that is rather a loose and very frequently used title, the island and rocks comprising the group have, for the convenience of a detailed description, been given individual names of Frenchmen celebrated in the early settlement of Canada. This bay is so shallow that for 3 miles from the bottom (into which flow two mouths of Mississagi River) there is less than 3 fathoms of water, and for 2 miles not more than 12 feet (in low stages there may be $3\frac{1}{2}$ feet less), the bottom over the whole bay being sandy.

For the convenience of surveying this bay, the *Bayfield* was anchored on the north side of Hennepin Island, about 590 yards eastward of the channel dividing the latter from Tonty Island, but, as the bay is open to westerly gales, it can not be recommended as an anchorage, especially as the holding ground is not very good.

Hennepin Island, the largest and easternmost of the chain, is 2 miles long, with a greatest breadth of 590 yards, and 1,320 yards from the west attains, in the shape of a dark wooded summit,

a height of 140 feet. The south side of the island may be approached to 150 yards and the bottom on the north side is level, with the exception of Briggs Rock.

Briggs Rock, with 6 feet on it, situated 880 yards from the north-western extremity of Hennepin Island and 280 yards offshore. Some idea may be formed of the small size and slight indication given by the soundings of the rocks on this north shore when it is stated that the *Bayfield* had the misfortune to get on this rock, though a boat was ahead sounding and the leadsman sounding in the ship steaming slowly.

Two rocks $1\frac{1}{2}$ feet above water lie north by west 370 yards and 590 yards, respectively, from the northeastern extremity of Hennepin Island.

Fisherman Gut, separating the latter from Webber Island, is not good for more than 6 feet of water even, which may be in the narrow channel between the northeastern extremity of Hennepin Island and the two small islets between it and Webber Island. A few fishermen are usually stationed here to attend to the pound nets in the locality.

Tonty Island is divided from the west end of Hennepin Island by a channel 150 yards wide, through which 11 feet can be carried, taking care in running through from the south to avoid the reef extending from the southwestern extremity of Hennepin Island; afterwards hauling over for the northwest point of the latter to clear the shoal which makes out from the northeast point of Tonty Island. The north and south shores of Tonty Island may be approached to 150 yards, but from the western extremity a reef of dry and sunken rocks extends 200 yards.

De Caen Rock, 6 feet high, lies west-northwest a little over 590 yards from the northwestern extremity of Tonty Island. It is 150 yards long east and west, and may be approached to 100 yards all round.

A depth of 17 feet water will be found between it and Tonty Island, while on the other side west-northwest a little more than 590 yards is situated a patch with 14 feet over it. The water of Mississagi Bay eastward of De Caen Rock begins to shoal more rapidly

La Salle Island, with a sharp, rocky top near its east end, 54 feet high, is situated a little more than 1 mile westward of Tonty Island; it is 590 yards long with an average breadth of 150 yards. The south side of the island is steep-to while from the east and north sides a bank under 3 fathoms extends 880 yards, the shoalest place with 12 feet over it being situated 440 yards east-northeast from the east end of La Salle Island. A depth of 18 feet may be carried through between the latter and De Caen Rock. A few fishermen are usually located on the western extremity of La Salle Island in the summer.

Richelieu Island lies 590 yards westward of La Salle Island, the gap between being nearly filled with dry rocks.

Talon Rock, quite small and $3\frac{1}{2}$ feet high, is the western of the chain and lies $8\frac{1}{2}$ miles 298° (NW. by W. $\frac{1}{4}$ W.) from Mississagi Island Lighthouse. A rock with less than 6 feet water on it lies 150 yards northeast from this rock, while its east and west sides are foul for a distance of 50 yards.

Steeple Rock, just covered, derives its name from its pinnacly nature and is a very dangerous obstruction, the soundings at 100 yards giving no indication of its existence. It lies southwest by west and is distant 590 yards from Talon Rock. This, together with Briggs Rock already spoken of, standing as they do like haystacks upon a level prairie will always make the existence of such rocks possible after the most carefully executed survey, and mariners can not be too vigilant in keeping a good lookout for any sign of discolored water when navigating on this northern coast.

De Roberval Point, which may be termed the north entrance point, is nearly 5 miles from the bottom of Mississagi Bay; it is a very ragged point, indented by numerous snug little sandy coves and strewn with rocks and islands.

From the western mouth of Mississagi River, the rushy north shore of the bay trends northwest by west 3 miles, and thence, west-southwest $1\frac{1}{2}$ miles to near Sayers Island.

Sayers Island, 9 feet high, is the easternmost of the group lying 200 yards off De Roberval Point; eastward of Sayers Island the water commences to shoal rapidly.

Joliette Islands, three in number, lie off the western part of this point, and form the south shore of a rocky bay known as Foul Bight. The western and smallest Joliette Island, 5 feet high, lies $1\frac{1}{2}$ miles north from Talon Rock. These islands should not be approached on the south side nearer than 440 yards.

Supply Point is a very inconsiderable projection lying 1,175 yards northwest by north from the western Joliette Islands, but a small cove on the west side of the point afforded good landing for provisions sent in to the parties on the construction of the Canadian Pacific Railroad, whence it derived its name.

Foul Bight is the rocky and shallow indentation contained between De Roberval and Supply Points. In the bight, or in the many coves about De Roberval Point, a boat will find safe shelter in westerly gales.

Mississagi Island is low, with a slight rise and trees on the north end and 1.175 yards long, north and south, its breadth being irregular on account of two coves which indent the eastern side. The lighthouse near its south coast lies 12 miles 309° (NW. $\frac{1}{4}$ W.) from that on Cape Robert and $8\frac{1}{2}$ miles 246° (WSW. $\frac{1}{4}$ W.) from O'Dwyer Island.

Light.—A fixed and flashing white light, 53 feet above water, visible 12 miles, is shown from a white, square, wooden structure on the southern end of Mississagi Island. (See Light List.)

A patch with 12 feet over it lies 250 yards southeast from the lighthouse.

North Point Shoal extending 440 yards from North Point is a narrow gravel bank with less than 6 feet water upon it a quarter of a mile northward.

Dog Point Shoal is a reef stretching 440 yards off from Dog Point, at which distance there is only 6 feet. The cove on the east side, in which is situated the wharf and boathouse belonging to the lighthouse, is fit only for boats and small tugs that will find excellent shelter in westerly gales.

Anchorage.—Vessels will find good temporary shelter from westerly gales under the east side of Mississagi Island in 4 to 5 fathoms, clay bottom.

West Islet, about 4 feet high and 70 yards in diameter, with an indentation on its north side, is situated 1,175 yards west-southwest from North Point of Mississagi Island, being connected thereto by a bank over which 12 feet may be carried in an emergency, by keeping the old and eastern burner at Blind River, touching the trees on the north end of Mississagi Island bearing 28° (NE. by N.) until 150 yards of the latter, when haul sharp to the northwest and keep the lighthouse right astern, but as shoal rocks make out 200 yards from the east end of West Islet and it is difficult to avoid a depth of 9 feet (in low stages there may be $3\frac{1}{2}$ feet less) in the middle of the passage; it is fit only for fishing tugs. A reef of dry and sunken rocks extends southwest by west 300 yards from the south point of West Islet.

McDonald Shoal, with 5 feet over it, is a rocky patch lying 440 yards northwest from the same with a depth of 3 to 4 fathoms between them.

Northwest Reef, with 13 feet over it, and in low stages there may be $3\frac{1}{2}$ feet less, is an important danger lying nearly 3 miles 299° (NW. by W.) from Mississagi Island Lighthouse, and from the reef the southwestern extremity of Mississagi Island is in range with the contrary side of West Islet.

Caution.—Passing southward of Mississagi Island in thick weather a vessel should not shoal to less than 10 fathoms.

Campana Shoal, with 17 feet on it, is the rocky head of a bank 1 mile in greatest diameter under the depth of 10 fathoms and a dangerous shoal for a heavy draft vessel. It lies 5 miles 98° (ESE. $\frac{1}{4}$ E.) from Mississagi Lighthouse and $4\frac{1}{2}$ miles 282° (WNW. $\frac{1}{4}$ W.) from the northwestern Cousin.

CHAPTER XIII.

NORTH CHANNEL—FROM CLAPPERTON AND McBEAN CHANNELS TO ENTRANCE OF GEORGIAN BAY.

The low water of 1895 (579 feet above mean tide at New York) was $3\frac{1}{2}$ feet below the datum used for this chapter.

Plan.—This chapter describes the southern shore from Clapperton Channel to Indian Dock Point and the northern shore from Kil-larney to McBean Channel.

West Bay is $8\frac{1}{4}$ miles long, the breadth between Wabos Island on the east and Francis Point on the west being $6\frac{1}{4}$ miles, and is a fine sheet of water with very few dangers. As much as 32 fathoms will be found in the middle of the bay and more than 20 fathoms within 100 yards of the east shore of the southern part. Anchorage may be had at the bottom of the bay in 6 to 8 fathoms over mud. Here is situated the Indian village, containing a Roman Catholic church and general store.

Logan Island lies nearly 1 mile southeast by south from Cartwright Point, being separated from the main island by a barrier of sunken rocks. The north side of Logan Island is shoal for 300 yards and its eastern side for 150 yards, while 590 yards in the latter direction is a spit with a depth of $3\frac{1}{4}$ fathoms, falling down suddenly to 20 fathoms.

Logan Bay is a double indentation westward of Logan Island, and although the water is shallow, the sandy bottom is fairly level, and temporary anchorage may be had in 15 to 18 feet between the eastern part of Logan Island and the south entrance point of the bay.

Carling Point.—This point is situated 590 yards southwestward of the islet on the south side of Logan Island, and may be approached to 250 yards from the east.

Carling Bay is contained between Carling and Baker Points, and should not be entered farther west than the line of these points.

Baker Point is situated nearly $2\frac{1}{4}$ miles north by east from South Point of Clapperton Island, and to within 880 yards of South Point the coast may be approached to 300 yards.

South Point lies 11 miles 267° (W. $\frac{1}{4}$ N.) from Narrow Island Lighthouse. A very shoal rocky spit makes off from the end of this point in a southerly direction, 440 yards, and a bank terminating in a rock with 9 feet on it extends 440 yards east from this point.

Note.—The northern side of Main Passage will be described in connection with the description of the northern shore of North Channel.

South shore of North Channel.—The Tooth is a small, sharp rock 3 feet high situated a little over 1 mile southward of Francis Point and 440 yards from the west shore of the bight; its east side should receive a berth of 150 yards. Between the Tooth and Francis Point the bight is foul.

Dutchmans Head is a steep bluff 180 feet high about 2 miles southward of Francis Point. Westward of Dutchmans Head is an extensive and shallow bight, in the southern part of which, however, a vessel may find shelter in westerly gales in 4 to 7 fathoms, with the Tooth touching Francis Point bearing 7° (N. by E. $\frac{1}{2}$ E.).

Honora Point.—From Dutchman's Head the shore trends in a southeasterly direction nearly 4 miles to Honora Point. The shore between is free from off-lying dangers. Under the southern hook of this point is an excellent little boat harbor into which 4 feet may be carried by keeping close to the west shore (at low stages it would be nearly dry).

Corbier Cove is the bight, in the western shore of West Bay, lying about 880 yards south of Honora Point. On account of exposure to north winds and its deep water, it does not afford a secure anchorage.

Shore.—From Corbier Cove the shore trends southeastward and south to the head of West Bay, then north-northeasterly from the head of the bay about 5 miles to Sounding Cove. All this shore is clean and bold to except in the bight at the head of the bay.

Sounding Cove.—Vessels may find good shelter from northerly gales in 5 to 7 fathoms over mud, by not approaching the north shore of the cove nearer than 300 yards.

Honora Village is small and situated upon the north shore of Sounding Cove. A small wharf with 17 feet of water alongside it was in 1886 being built at the village.

Tamarac Point, the southern part of which is $5\frac{1}{4}$ miles from the bottom of West Bay, may be approached to 150 yards.

Freer Point.—From Tamarac Point the shore runs fairly straight for about $4\frac{1}{2}$ miles in a general northeast by east direction, then turns abruptly to northwestward, forming Freer Point. The first 3 miles is clean except for a shore bank which follows the shore at less than 440 yards.

Wabos Island lies over 1.175 yards west of Freer Point and forms the east entrance point of West Bay. It is low, narrow, and wooded, and 440 yards long in a northeasterly direction. Its north shore may be approached to within 100 yards, out from its southwestern end a

shoal extends 880 yards in the same direction. In addition to this, an extensive flat connects it with Freer Point and the shore $1\frac{1}{2}$ miles southwestward of Freer Point.

Wabosons (Little Rabbit) Island is a low, wooded islet 440 yards eastward of Wabos Island, and between them there is a passage through which 16 feet can be carried by keeping the southeast point of Mink Island (near East Rous Island) midway between Wabos and Wabosons Islands, bearing 51° (NE. by E.). Sunken rocks and dry stones connect Wabosons Island with Freer Point 4 miles to Tamarac Point, and off which coast a vessel may obtain temporary anchorage in 5 to 8 fathoms, sand and mud.

James Foote Patch, with $3\frac{1}{4}$ fathoms on it, lies a little over 2 miles northward of Freer Point, but with this depth it can hardly be considered an obstruction, excepting to the centerboard of a sailing vessel. This patch, however, has been especially mentioned, because it was supposed by many of the navigators of this locality at that time that dangerously shoal water exists farther south than really is the case.

A channel nearly 1,175 yards wide, having from 4 to 8 fathoms water in it, exists between these shoals and Bedford Island. Vessels should, however, pass south of these shoal banks by keeping the north end of Picnic Island in range with or south of the south side of Narrow Island, bearing about 85° (E. $\frac{1}{2}$ S.). The south fall of Frazer Bay Hill will also be seen on this range.

The northeast side of Elm Island touching the southwest side of Amedroz Island, bearing 313° (NW. $\frac{1}{4}$ N.) leads southwest of Eleven Foot Rock.

Foster Bank, with 6 feet least water on it, lies with its eastern and shoaler end a little over $2\frac{1}{4}$ miles northward of Freer Point. From this position the bank runs westward 880 yards. A vessel may stand toward Foster Bank from the east until the northeastern extremity of Bourinot Island is touching Straubenzee Point (the southwestern extremity of Bedford Island), bearing 328° (NNW. $\frac{1}{4}$ W.).

Eleven Foot Rock, with 11 feet of water on it, is situated 440 yards westward of Foster Bank.

The red sector from Narrow Island Light covers these three shoals, the northern limit passing only 150 yards northward of Foster Bank; and the southern edge of the red sector leading 1,320 yards southward from James Foote Patch.

Mackay Point.—From Freer Point the shore trends in an east by north direction for 3 miles to Turner Cove; then northeastward for $1\frac{1}{2}$ miles to Mackay Point. Although not dangerously shallow, it is so shelving that vessels drawing 12 feet should not approach nearer than 440 yards.

Little Current Channel.—**Narrow Island** is over 590 yards long east and west, and, as its name indicates, has very little breadth. The lighthouse on the northwest point of this island is nearly $\frac{1}{2}$ mile 3° (N. $\frac{1}{4}$ E.) from Mackay Point. No vessel of heavy draft would go southward of the line of the lighthouse and the northwest point of Picnic Island. A rocky bank with depth under 18 feet extends 150 yards from the whole of the north side of Narrow Island. **Narrow Island Light** is important as marking the south entrance point of the western approach to Little Current, and, unlike Flat Island, on the opposite side, the north shore of Narrow Island may be approached to 200 yards.

Light.—A fixed white light, with a red sector, 36 feet above water, visible 11 miles, is shown from a white wooden tower on the western end of Narrow Island. (For bearings of sectors see light list.)

Fog signal.—A hand horn is sounded in response to vessels' signals.

Two Rocks, with 6 feet of water on them, lie 440 yards westward of Narrow Island Lighthouse, and to lead north of these dangers the whole of Picnic Island should be kept open northward of Narrow Island, bearing 100° (ESE. $\frac{1}{2}$ E.).

The Manitoulin shore inside Picnic and Low Islands trends in a general easterly direction about 2 miles, forming a sheltered bight eastward of Miller Point, in which craft drawing less than 9 feet may find good anchorage by entering between Miller Point and the islet 4 feet high lying about 440 yards west-southwestward from the northwestern point of Picnic Island.

Picnic Island lies about $1\frac{1}{2}$ miles eastward of Mackay Point and has an average diameter of 590 yards. On its eastern side is a saw-mill and wharf, with good water alongside for loading; lumber piles occupy much of the island. Close to its broad north point there is a depth of 21 feet, and since the removal of Maltas Shoal the channel is about 300 yards wide at this point and is marked by two red and two black spar buoys.

The northeast coast is equally steep-to, but 200 yards therefrom were depths of 13 and 14 feet, which have been removed, giving a uniform depth of 21 feet of water; in this western approach a red spar buoy marks the edge of the bank on the north side of the channel. Westward of Picnic Island the rapidly widening channel is over 5 fathoms deep. An old footbridge connects Picnic Island with the Manitoulin shore.

An islet 4 feet wide, with stones about it, lies 440 yards west-southwest from the northwest point of Picnic Island, and from its northwest side shoal water extends 150 yards.

Low Island, about 590 yards in diameter, lies next east of Picnic Island, being separated therefrom by a channel about 1 mile wide. The island has a sawmill and is used as a piling ground for lumber. The rocky patch that used to lie 80 yards off the north point has been removed, the dredged channel passing close past this point, the edges of which are marked by red and black spar buoys, respectively.

Spider Island, situated about 440 yards eastward of Low Island, is low, flat, 250 yards in length by about 70 yards in breadth. It is occupied by a sawmill and lumber piles which obscure the lighthouse from the west until nearly abreast of it.

Light.—A fixed white light, 40 feet above water, visible 6 miles, is shown from a white, square tower on the eastern end of Spider Island.

Little Current occupies an important position on the Manitoulin Island side of the narrow passage, in which is considerable current at times—hence its name—and through which all vessels must pass when using this part of North Channel of Lake Huron. The shoalest part of the passage, however, was that section from the northern point of Low Island (880 yards northwest of Spider Island Lighthouse) to the northwestern extremity of Picnic Island, where for nearly 1,320 yards the channel has been dredged to a depth of 21 feet below the same datum. Between the northern part of the town and Magazine Point (the southwestern extremity of Goat Island) is a rocky bar nearly 300 yards broad, across which a channel has been excavated to a depth of 21 feet, corresponding to 579 feet above mean tide at New York.

Buoys.—The channel north of Picnic and Low Islands is marked by four red and three black spar buoys.

The channel abreast Little Current is marked by three red spar buoys to the eastward and two black spar buoys to the westward.

Range Lights—Front Light.—A fixed red light, 31 feet above water, visible 6 miles, is shown from the roof of a warehouse near the shore in the village.

Rear Light.—A fixed red light, 58 feet above water, visible about 1 mile, is shown from a mast 133 yards 174° (S.) from the front light. These in range lead through the 21-foot dredged cut.

Bridge.—On Shutin Point, situated nearly 1,175 yards southeastward from the range lights, is erected the Manitoulin Island end of the Algoma Eastern Railroad Co. swing bridge, which crosses the channel to Goat Island in a northeast by north direction, affording railroad connection with the Canadian Pacific (Sudbury and Sault Ste. Marie Branch) at Espanola, about 37 miles from Little Current.

The swing when open affords two passages, each 150 feet broad, one on each side of the swing, the northeastern passage being for

vessels bound northwest and the other for those proceeding south-eastward; in other words, vessels keep to starboard. In 1914 the normal condition of the swing was open.

Bridge signals.—Vessels ready to pass through the bridge will sound two long, followed by two short blasts on the steam whistle, and masters of vessels should not attempt to pass through until the swing is open which at night is indicated by a green light on the swing pier and a white light on each side of the passage to be used. A red light on the swing pier means that the passage is closed.

Caution.—The stone pier for the support of the swing when it is open does not lie parallel to the axis of the current, so that vessels have the latter $1\frac{1}{2}$ points on the bow, which when strong must be guarded against.

Town wharf.—The town or Turners Wharf is 250 feet long, with depth of 20 feet in 1914, and was in a very dilapidated condition in that year. About midway between the wharf and Shutin Point and extending 120 yards from the shore is a small lump called Eleven Foot Rock, with that depth upon it with slightly deeper water south of it.

Buoy.—A black spar buoy marks this rock.

Current.—The current giving rise to the name of the town and passage sets very strongly at times in either direction, requiring, when contrary, a good head of steam and a careful helmsman.

Communication—Industries, etc.—As above indicated, the town has railroad communication with the rest of Canada by the Algoma Eastern Railroad and frequent steamboat connection with the southeast points of Georgian Bay and Sault Ste. Marie.

There is telegraphic communication with the general Canadian system, and telephonic connection with all the principal villages in Manitoulin Island.

Three sawmills are established on the shore and islands westward of the town. The Spanish River & Sault Ste. Marie Pulp Co. contemplates the erection of a warehouse on Goat Island for the shipment of paper. Coal and supplies can be obtained, a considerable quantity of the former being landed on Goat Island by a conspicuous and powerful iron crane and transporter and carried to Espanola by railroad. At present (1914) wharfage accommodation on the town side is limited and in bad shape. Little Current is a customs port of entry.

Griffiths Point.—From Shutin Point the south shore of Little Current trends eastward a little over 440 yards to Griffiths Point, with depths under 18 feet extending therefrom 100 yards.

Beacons.—A white, rectangular, slatted beacon marks Griffiths Point.

A similar beacon is located on Shutin Point 500 yards 277° (WNW. $\frac{1}{2}$ W.) from the beacon on Griffiths Point.

These in range astern lead through the best water in the channel from a point 200 yards eastward of Griffiths Point Beacon to the intersection with the Goat Island Range.

A small white wooden beacon is located on the south shore of Goat Island about 300 yards west of the extremity of Bird Point.

This in range with the chimney on the section man's house, also on Goat Island, bearing 316° (NW. $\frac{1}{2}$ N.) astern leads from the intersection with the range of the Griffiths Point and Shutin Point southwest of Beauty Island Bank to the intersection with the range of Griffiths Point Beacon and Picnic Island Burner.

Griffiths Point Beacon in range with the large sawmill burner on Picnic Island bearing 293° (NW. by W. $\frac{1}{2}$ W.), astern, leads from the intersection with the Goat Island range south of Beauty Island Bank.

Buoys.—This section of the channel is marked by seven red and six black spar buoys.

Gibbons Point, which may be called the south entrance point to Little Current from the east, is situated about 600 yards southeastward of Griffiths Point, and nearly midway in the deep bight between them and 300 yards from the shore is a low wooded islet.

Gibbons Bank.—A rocky bank with 12 feet least water on it extends 200 yards northeastward from Gibbons Point and should be passed to northward by heavy draft vessels proceeding through Little Current.

Buoys.—Four black spar buoys mark the east and north sides of this bank.

North shore of Little Current Channel.—**Flat Island**, which may be regarded as the southwestern extremity of Great Cloche Island, is about 400 yards long north and south and the same width. It is connected to Great Cloche Island by a shoal having a least depth of 3 feet. Shoal water extends about 150 yards westward and 250 yards southward of the island.

A detached, rocky shoal with 12 feet least depth lies about 375 yards southwest of the southwestern extremity of Flat Island.

Patten Island, about 880 yards long east and west and having a greatest width of 440 yards, lies eastward of Flat Island. Shoal water extends on an average of 600 yards south from it.

Maltas Island lies close eastward of Patten Island and is connected to Great Cloche Island by a narrow neck of land. Shoal water extends about 800 yards southward from its southern extremity.

Shore.—From Maltas Island the shore of Great Cloche Island trends in a southeasterly direction, is very irregular, and is fronted by islands and shoal water for quite a distance.

476. LITTLE CURRENT CHANNEL FROM MANITOWANING—DIRECTIONS.

Goat Island lies southward of Great Cloché Island and, together with Beauty Island, forms the northern shore of Little Current east of that town.

Magazine Point is the southwestern extremity of Goat Island.

Between Magazine Point and the railroad bridge is a long wharf belonging to the Algoma Eastern Railroad Co., and at the coal hoist is another with ample water for deep-draft vessels.

Boom.—To keep towed logs from grounding on the shallow bank from Magazine Point a boom is moored by means of several stone heaps or cribs around the edge of this bank.

Mallard Cove, a small and shallow indentation on the southern shore of Goat Island, lies about 1,250 yards eastward of Magazine Point.

Bird Point, the southeastern extremity of Goat Island, which is $1\frac{1}{4}$ miles long and a little under 880 yards wide, may be considered the north entrance point to Little Current from the east. It lies a little over 440 yards northeast by north from Gibbons Point, the south entrance point. Not more than 18 feet will be found 200 yards southward from the point, and from the Goat Island coast 250 yards westward of Bird Point the bank under that depth makes out 270 yards.

A range beacon (previously described) is 300 yards westward of the point.

Buoy.—A red spar marks the edge of this bank 300 yards southwest of Bird Point.

Goat Island Channel is the rocky passage, fit only for boats, situated north of Goat Island.

Beauty Island, elevated 70 or 80 feet at its northern extremity, is situated northward of the eastern approach to Little Current and northeastward 1,175 yards from Gibbons Point. It is 1,175 yards long, west by north, by 590 yards wide, and lies $1\frac{1}{4}$ miles west-northwest from Strawberry Island Lighthouse. It is separated from Goat Island on the west by a boat channel nearly 200 yards broad. Its southeast point is fairly bold to, but from its southern shore a rocky bank extends over 440 yards, and which must be carefully guarded against by vessels approaching or leaving Little Current.

Directions.—**From Manitowaning**, after passing Phipps Point Shoal and Loon Island Reef, give East Point of Strawberry Island a berth of 440 yards, taking care as Langevin Rock and Caron Reef are approached to have the whole of Loon Island open of East Point, the latter bearing 185° (S. by W.) to clear the first, while the east side of the island in sight bearing 177° (S. $\frac{1}{4}$ W.) is sufficient to lead northeast of Caron Reef.

A vessel may haul westward when the northern extremity of Beauty Island appears in sight touching Strawberry Island Lighthouse.

bearing 298° (NW. by W.). The light should be rounded fairly close to avoid Garden Island Bank and the entrance to Little Current brought $\frac{1}{2}$ point on the starboard bow. Bring the largest burner on Picnic Island in range with Griffiths Point Beacon 293° (NW. by W. $\frac{1}{2}$ W.). Hold this range until the alignment of the Goat Island Range is reached, when steer 316° (NW. $\frac{1}{2}$ N.) until the beacon on Shutin Point comes in range with that on Griffiths Point, bearing 277° (WNW. $\frac{1}{2}$ W.). Hold this range until about 200 yards off Griffiths Point Beacon, when haul up for the swing bridge and pass through as directed. When west of it, steer for the town wharf, from which haul sharply northward through the dredged channel with the range lights in range astern, bearing 174° (S.) until 100 yards northward of Spider Island Lighthouse, when a vessel may haul westward to pass 150 yards northward from the north point of Low Island.

From the east, after passing southward of Center Island Bank by the clearing marks given for it, steer to pass 440 yards from Wharton Point (the southwestern extremity of Heywood Island), when haul northward, steering 324° (NNW. $\frac{1}{2}$ W.). As Caron Reef is approached follow the directions already given from Manitowaning.

By Strawberry Island Channel, in a light-draft vessel, having cleared the several shoals in Sheguiandah Bay by the clearing marks and line of range lights, round South Point of Strawberry Island at 440 yards and bring Gow Point in range with the east side of Snake Island, bearing 12° (N. by E. $\frac{1}{2}$ E.), which mark will lead close west of the bank from South Point. Pass 150 to 200 yards east of Snake Island and bring South Point in range with the west side of Leech Island, bearing 187° (S. by W. $\frac{1}{2}$ W.), which leading mark leads in not less than 20 feet, until north of Thompson Point.

When the west low extremity of Beauty Island is in range with Long Point, 339° (N. by W. $\frac{1}{2}$ W.), steer for it, taking care on nearing Long Point to have the east side of Snake Island open east of Thompson Point, bearing 178° (S. $\frac{1}{2}$ W.), to clear the spit from Long Point. Then steer for Goat Island and proceed as before directed.

Directions, Little Current to Clapperton Island Lighthouse.—Give the north side of Spider Island a berth of 150 yards, pass 150 yards north of Low Island, 50 to 100 yards northward of Picnic Island, and 200 yards north of Narrow Island Lighthouse; then steer 256° (W. $\frac{1}{2}$ S.) for $1\frac{1}{4}$ miles, when the north side of Picnic Island should be in range with the south side of Narrow Island, bearing 85° (E. $\frac{1}{2}$ S.).

By day, this leading mark kept on astern will lead a vessel 590 yards southward of Foster Bank but over James Foote Patch, with a depth of 19 feet at low stages, nearly 5 miles from Narrow Island

Lighthouse. A heavy-draft vessel by day, and all vessels by night, should continue the 256° (W. $\frac{1}{2}$ S.) course, almost coincident with the southern limit of the red sector from Narrow Island Light. By keeping on this dividing line of red and white light a vessel will pass 1,320 yards southward of James Foote Patch.

When, by day, the northwest side of Elm Island is touching the southwest side of Amedroz Island, bearing 313° (NW. $\frac{1}{4}$ N.) a vessel may steer 308° (NW. $\frac{1}{2}$ W.) for Cartwright Point, the northeastern extremity of Clapperton Island, taking care, as Elm Island Bank is approached, to see that the rocky summit of Wilson Point (Croker Island) is in sight southwest of Amedroz Island, bearing 323° (NNW. $\frac{1}{2}$ W.). Cartwright Point may be rounded close to, and the coast of Clapperton Island kept on board as far as the lighthouse. When up to the bluff point 880 yards eastward of the latter, see that the south end of Amedroz Island is closed with Cartwright Point, bearing 116° (SE. by E. $\frac{1}{4}$ E.) to pass southward of Robertson Rock.

At night a vessel should keep on the south limit of the red sector for 6 miles from Narrow Island Lighthouse, when she should haul northward for the middle of the passage between Amedroz and Clapperton Islands, steering 330° (NNW. $\frac{1}{2}$ W.).

When abreast of Cartwright Point, proceed as directed by day, remembering that on account of the trees Clapperton Island Light is not visible until bearing southward of 259° (W. $\frac{1}{2}$ S.).

If bound to McBean Channel, after passing Picnic Island, keep the north sides of it and Low Island in range, bearing 108° (SE. by E. $\frac{1}{2}$ E.) to pass southwest of the shallow bank from Great Cloche Island. When Narrow Island Lighthouse bears 182° (S. $\frac{1}{4}$ W.) haul northward and steer 2° (N. $\frac{1}{4}$ E.) through Wabuno Channel, giving East Rous Island and the islet close to the southeast side of Schreiber Island a berth. The north point of the latter may be rounded close to, when a course 291° (NW. by W. $\frac{1}{2}$ W.) for 10 miles made good will take a vessel to East Rock (Fox Island). Pass 200 yards northward of it and steer for Bald Rock, distant a little over 1.3 miles.

Long Point is a remarkably narrow peninsula, 1,320 yards long, with its outer and northeastern extremity situated nearly $1\frac{1}{4}$ miles from Gibbons Point; the shore of the bight between them should not be approached nearer than 440 yards. A narrow shoal spit extends from the extremity of this point in the continued direction of the latter 200 yards. Nearly midway between these two points, in the deep bight, a low wooded islet is situated 300 yards from the shore.

Thompson Point, on the Manitoulin Island shore, is situated nearly $1\frac{1}{4}$ miles south of Long Point; the shore of the bight between them should not be approached west of the line joining these points, between which is a group of dry stones 2 feet high and sunken rocks.

The western edge of Strawberry Island Channel is 590 yards from the southwest part of Thompson Point, 100 yards from which there is a small islet, but the deep water approaches the narrow northern extremity of the point within 150 yards.

Snake Island, 33 feet high, lies $\frac{1}{4}$ mile northwest of South Point (Snake Island), being 440 yards long by 200 yards broad and joined to Frost Point on the Manitoulin Shore by a bank over which not more than 6 feet water can be carried in 1885. Shallow water extends over 440 yards northward from Snake Island, but deep water approaches the east side to within 100 yards.

Frost Point (which with Sims Point may be said to inclose the bottom of the bay) is over $2\frac{3}{4}$ miles south by west from Thompson Point; the shore between consists of a double curve, from the middle part of which shoal water extends 1,175 yards. A depth of 3 fathoms will be found 150 yards south and east of the point.

Strawberry Island is 5 miles long in a nearly north and south direction, with a maximum breadth of $1\frac{1}{2}$ miles near the middle. Its shore line is indented by numerous large coves.

South Point is the most southerly extremity of the island, situated west-northwest $2\frac{3}{4}$ miles from Loon Island. The depth of 16 feet will be found 350 yards south of the point and 15 feet at 150 yards, and a vessel will pass south of this bank by keeping Sheguiandah Range Lights in range, bearing 261° (W. $\frac{1}{4}$ S.). From South Point the southeast shore of Strawberry Island trends in a general north-east direction, $3\frac{1}{4}$ miles to East Point, which lies west by north a little over 2 miles from Oxley Point (Heywood Island).

Whites Cove, shallow and full of rushes, is situated a little over 1,320 yards northeast from South Point; shoal water extends from its mouth nearly 300 yards.

Beaver Island, with its south end situated $1\frac{1}{2}$ miles east-northeast from South Point, is a very narrow island, 1,175 yards long in a north-northeast direction and 325 yards wide near its north end, low and thickly wooded. Its eastern shore may be approached to 200 yards, but from the sharp southern extremity shoal water extends in a southwesterly direction under the name of Beaver Island Bank, nearly 1,175 yards, with depths varying from 15 to 18 feet.

Beaver Island Harbor is formed by Beaver Island on the east and the large bight in Strawberry Island on the west. It is entered from the southwest and anchorage in 3 to $3\frac{1}{2}$ fathoms may be obtained with the south point of the island touching Ten Mile Point and the north point of Beaver Island in range with the southern part of East Point. A bar with 9 to 10 feet of water on it joins the north end of Beaver Island to Strawberry Island.

Directions.—If from Georgian Bay, when westward of Center Island Bank, steer 265° (W. $\frac{1}{8}$ N.) with Sheguiandah Hill a trifle

Sims Point projects from the southern shore of the bay and may be approached to within 150 yards.

Public wharf.—Between Sims Point and the wharf, at which there is a depth of 12 feet, the coast gradually curves forming the bottom of Sheguiandah Bay, and which heavy-draft vessels should not approach nearer than 440 yards. The outer portion of the wharf runs westward 80 yards, and thence northwest 170 yards to the shore.

Leech Island is a narrow bank of stones thickly wooded and separated from the south shore of Sheguiandah Bay by a rushy boat channel; it is 880 yards eastward of Sims Point. The shore between Ten Mile Point and Leech Island consists of several slight indentations, having at an average distance of 200 yards a depth of 12 feet. A steep clay cliff, over 200 feet in height, follows this shore along at a distance back of about 440 yards.

Leech Island Reef extends 880 yards northeastward from Leech Island, at which distance the depth of 17 feet will be found rapidly shoaling toward the island. The north points of Loon and King William Islands in range bearing 95° (E. by S.) lead northward of this reef. At night Sheguiandah Range Lights in range bearing 261° (W. $\frac{1}{4}$ S.) lead north of the reef.

King William Island, 200 yards long, quite narrow, low, and wooded, is 1 mile east-northeast of Leech Island. It is almost joined to the south shore of the bay by a narrow bar with 7 to 9 feet water over it, and 15 feet may be carried through by keeping nearer the south shore, but the passage is too narrow to be attempted by strangers. The east side of the island is shoal for 150 yards, and a rocky spit, with 7 feet water on it, extends 250 yards from its northern extremity, to clear which keep the north end of Rabbit Island (when visible) in range with the north point of Loon Island, bearing 103° (ESE. $\frac{1}{4}$ E.).

Boulton Reef, with 9 feet of water over it, lies with its northern extremity east-northeast, 1,320 yards from the north point of King William Island. The foot of Sheguiandah Hill, in range with South Point of Strawberry Island, bearing 276° (WNW. $\frac{1}{4}$ W.) leads 200 yards northward of Boulton Reef.

At night Sheguiandah range lights in range bearing 261° (W. $\frac{1}{4}$ S.) lead the same distance north of Boulton Reef.

MacGregor Bank, 590 yards long northeast and southwest and 300 yards broad, with least water 9 feet, lies with the center 1 mile east of King William Island; the line joining the south points of Loon and King William Islands passes through its south extremity.

The leading mark, South Point of Strawberry Island open northeast of King William Island half the breadth of the latter bearing 299° (NW. $\frac{1}{4}$ W.), leads southwest of MacGregor Bank and the shoal water from the south point of Loon Island.

Loon Island, low and wooded, 250 yards long and 100 yards broad, is situated nearly $1\frac{1}{2}$ miles in an east by south direction from King William Island and $1\frac{1}{2}$ miles north by west from Ten Mile Point. From the south point a shoal extends south-southwest 440 yards, its other sides being fairly steep-to.

Loon Island Reef, with 7 feet water on it, is a dangerous obstruction, lying 1 mile eastward of Loon Island.

Clearing marks.—To pass east of Loon Island Reef keep the southeast fall of Cloche Bluff in range with the west point of Heywood Island bearing 14° (N. by E. $\frac{1}{2}$ E.), but as this mark leads only 200 yards eastward of the reef, care should be taken not to open the bluff the least thing. To pass 200 yards westward of the reef keep The Rock (Manitowaning) in line or closed with Ten Mile Point, bearing 181° (S. $\frac{1}{2}$ W.).

From the south it should not be approached nearer than the line of the southern extremities of King William and Loon Islands in one, bearing 277° (WNW. $\frac{1}{2}$ W.). To lead northward of the reef keep the foot of Sheguiandah Hill in line with South Point of Strawberry Island, on the last bearing.

Range light—Front.—A fixed white light, 23 feet above water, visible 9 miles, is shown from a mast on the outer end of the Government wharf.

Rear.—A fixed white light, 35 feet above water, visible 11 miles, is shown from a white square tower with a dwelling attached, 317 yards 261° (W. $\frac{1}{4}$ S.) from the front light.

These lights in range lead to the wharf northward of all the shoals just described, and south of those from Strawberry Island.

These day marks being difficult to see in the afternoon, the wharf shed under the middle of a table shaped hill a couple of miles back is a fair substitute.

Sheguiandah.—This village contains a post office, Methodist and Anglican Churches. Steamers between the southeastern ports of Georgian Bay and Sault Ste. Marie stop here when there is occasion. It is connected by telephone with Little Current and the other villages on the island.

Manitowaning Bay, the next indentation south of Sheguiandah Bay, is a fine sheet of water, and, from the northern part of Ten Mile Point, is 10.6 miles in length, the breadth from the above point to Rabbit Island being $4\frac{1}{2}$ miles, and clear of outlying dangers. At the bottom is pleasantly situated the town of Manitowaning, where reside the Indian superintendent and medical officer for this and Wekewemikong Indian reserves. Limited supplies can be obtained here, and almost daily steamboat communication had with Sault Ste. Marie, and the southeastern ports of Georgian Bay. There is stage connection with Michael and Providence Bays, telephone communica-

tion throughout the island, and telegraphic connection with the mainland via Little Current.

Ten Mile Point, the western entrance point of Manitowaning Bay, derives its name from being about that distance from the town of Manitowaning. The coast between Sandy and Ten Mile Points may be approached to 250 yards.

Ten Mile Shoal extends northward 590 yards from Ten Mile Point, at which distance there is a depth of 13 feet (1885). South Point of Strawberry Island open northeast of King William Island half the breadth of the latter, bearing 299° (NW. by W.), leads north of Ten Mile Shoal.

Five Fathom Patch, with $5\frac{1}{2}$ fathoms on it, lies $1\frac{1}{2}$ miles eastward from the nearest part of Ten Mile Point.

Sandy Point, indicated by its name, is in itself steep-to. It is 2.3 miles south by west from Ten Mile Point and the same distance north-northeast from Francis Brook.

Francis Bank.—Fronting the coast embraced by Francis Brook and Sandy Point is a shoal, rocky flat, which at a little over 1,320 yards from Francis Brook extends 590 yards from the shore. To avoid Francis Bank keep the whole of Heywood Island well open of the western shore of the bay, the latter bearing 9° (N. by E. $\frac{3}{4}$ E.). From Francis Brook the shore trends southward for $2\frac{1}{2}$ miles, then southeastward for about $2\frac{1}{2}$ miles to Manitowaning Harbor.

Manitowaning Harbor.—The southern portion of the bight formed between Narrow Point and the town wharves is shallow, but as the latter are approached the water deepens and good anchorage may be obtained between them and Fanny Island in 3 to 5 fathoms, mud, the nearer the town the better the shelter. Although vessels anchor for convenience near the town, the whole space southward of the line joining the lighthouse and Moccasets Landing may be considered one excellent harbor, anchorage being obtainable in any depth under 10 fathoms.

Population.—In 1911 the white inhabitants of the village numbered 248, the number of Indians on the Manitowaning and Wekewemikong Reserves being 1,589.

Fanny Island is situated southward of the usual anchorage under the town of Manitowaning. Its north, northeast, and northwest sides are fairly steep-to, but shoal water joins its southern extremity to Narrow Point on the main shore.

Narrow Point is situated 250 yards southward of Fanny Island and 880 yards northward from the western end of the beach at the bottom of the bay, and should receive a berth of 200 yards.

The Rock is an eminence, 166 feet high, 880 yards westward of the town, and which serves as a leading mark to clear Loon Island Reef.

From Town Point the west shore of the bay trends in a northwesterly direction $2\frac{1}{2}$ miles to Springer Brook, and is steep-to. Then the coast runs north $2\frac{1}{2}$ miles with the same character to Francis Brook.

Light.—A fixed white light, 80 feet above water, visible 14 miles, is shown from a white, square, wooden structure on the hill in Manitowaning Village.

Gibraltar Cliff is a rather remarkable rocky bluff a little over 880 yards from the beach at the bottom of the bay, and as this cliff is just in sight when on Phipps Point Shoal, care should be taken when approaching or leaving Manitowaning that it is well open of the eastern shore.

Wharves.—On Town Point is the Manitoulin Rolling Mill, for the convenience of which a wharf, 150 feet long with depth of 12 feet, fronts the shore southwest of the point. The town wharf with about the same depth is situated 150 yards southwest of the point, and 150 yards northeast of the latter is a small third wharf. Town Point itself is steep-to.

Stephens Cove.—From the bottom of the bay the shore trends northeastward $1\frac{1}{2}$ miles to Stephens Cove and shoal water extending from it makes it inadvisable to approach nearer than 440 yards.

Moccasets Landing is a small wharf on that part of the east shore 1 mile northwestward of Stephens Cove, and immediately opposite the town of Manitowaning. The shore between may be approached to 200 yards. A sailing ferry boat plied between the town and Moccasets Landing in 1885 and a road joins the latter to the Indian village of Wekwemikong (Smith Bay).

Buzwales Cove is the indentation 2 miles northward of Moccasets Landing, and is shallow.

The shore between it and Moccasets Landing may be approached to 200 yards.

Phipps Point, forming the northern side of Buzwales Cove, lies about 4 miles northward from the head of Manitowaning Bay. A shore bank fronts it.

Phipps Point Shoal, a rocky patch with 9 feet least water on it, lies 440 yards westward from the southern part of Phipps Point. The shoal within the depth of 3 fathoms is 440 yards in length north and south by 200 yards in breadth and is separated from Phipps Point Shore Bank by a channel 250 yards broad and 6 fathoms deep.

Clearing mark.—Strangers should pass 590 yards westward of the shoal by keeping Fanny Island, in Manitowaning Harbor, touching Town Point bearing 178° (S. $\frac{3}{4}$ W.) and at night the light on the same bearing.

Fanny Island, being thickly wooded, is hard to distinguish from its background, and a white beacon on its west coast would be useful. The mill and black iron smokestack are good marks for Town Point.

Ironsides Rock, 5 feet high, is a small collection of bowlders 100 yards from the shore, situated over 2 miles northeastward of Phipps Point. The coast between may be approached to 300 yards.

Pender Islets, two small islands lying 2.6 miles northeastward of Ironsides Rock and 880 yards from Monk Point, may be approached to 200 yards.

The coast between the islets and Ironsides Rock may, when 1,320 yards southward of the former, be approached to 200 yards.

Monk Point is 880 yards northeastward of Pender Islet. Between them the shore is foul for an average of 440 yards.

Rabbit Island.—The north point of this low and thickly wooded island lies 1 mile northeastward of Monk Point, and the shore between them is foul for 590 yards. Rabbit Island, 590 yards long by 200 yards in greatest breadth, is separated from the shore by a passage 350 yards wide, through which, by keeping nearer the island, a depth of 2 fathoms may be carried.

Clearing mark.—The highest part of Leading Mark Hill seen over the southeastern extremity of the main portion of Center Island, bearing 50° (NE. by E.), leads northwestward of all the shoal water between Indian Dock Point and Rabbit Island.

Rabbit Island Rock, with 5 feet water over it, lies 880 yards southwestward from the west point of Rabbit Island, and to avoid it keep Indian Dock Point and Lisgar Island well open northwestward of Rabbit Island, the north point of the latter bearing 61° (ENE.).

Indian Dock Point.—This low point may in a sense be said to be the eastern entrance point of Manitowaning Bay. Shoal water extends from the shore on either side of this point for nearly 440 yards. Southwestward 880 yards and 300 yards, respectively, from the point are situated Dufferin and Lisgar Islands, small and wooded.

Heywood (Rat) Island is nearly 2.6 miles long east and west, with an average width of 1,320 yards, and rises to a height of 178 feet. The water on the south shore is good to the line of the points. Southeast Point, the name given to that point of the island, is also steep-to and lies $1\frac{1}{4}$ miles westward from the western and nearest part of Partridge Island. Wharton Point, the southwestern extremity of the island, lies 2.2 miles southeastward of East Point, Strawberry Island.

Powell Cove is an indentation on the east side of the island northward of Southeast Point and in which a vessel may find shelter from westerly gales in 5 fathoms mud and sand.

Powell Cove Bank, with 3 feet water over it, lies southwestward of Heywood Rock, and a channel of 3 fathoms exists between it and Heywood Island.

Watts Rock, with 1 foot water on it, is a small obstruction lying between Southeast Point and Partridge Island, and nearly 880 yards

from the former. A spur of 3 fathoms extends from it in a northwest direction nearly 200 yards. A depth of 14 fathoms will be found between this rock and Heywood Island.

Clearing marks.—To pass southward of this danger, keep the summit of Badgeley Island in line with the north side of Partridge Island bearing 72° (ENE. $\frac{1}{2}$ E.). Frazer Bay Hill in range with Richards Reef, bearing 41° (NE. $\frac{1}{2}$ E.), leads southeast of this danger.

Heywood Rock, 3 feet high, is a white quartz reef lying north by east 1,320 yards distant from Southeast Point and 590 yards from the nearest part of Heywood Island. A rocky spit extends from it northward 100 yards; and a bar connects it with Powell Cove Bank, over which, however, a vessel may carry 3 fathoms by keeping the north end of Northwest Burnt Island exactly in line with the south side of Partridge Island, bearing 115° (SE. by E. $\frac{1}{4}$ E.); Heywood Rock is otherwise steep-to.

Split Rock is a very dangerous obstruction to vessels using this channel; it lies with Heywood Rock nearly in line with the north side of Heywood Island, bearing 274° (W. $\frac{1}{2}$ N.), and 1,175 yards from the former; it has deep water all around it.

Clearing marks.—Skull Point (Manitoulin Island), open southwest of Partridge Island, bearing 124° (SE. $\frac{1}{2}$ E.), leads close southwest of Split Rock. The north shore of Heywood Island, kept well open north of Heywood Rock, will lead north of the same.

Shoal Island is the island on the eastern side of the large bight on the north shore of Heywood Island, its north point bearing situated nearly 1 mile west by north from Heywood Rock.

Shoal Island Spit extends 590 yards in a northwesterly direction from Shoal Island, and has on it depths varying from 6 to 12 feet.

Clearing mark.—The southwest side of Partridge Island in range with Heywood Rock, bearing 116° (SE. by E. $\frac{1}{2}$ E.), leads northeastward of this spit.

Croker Island.—This island is 1.3 miles long north and south and is separated from Clapperton Island by a channel $1\frac{1}{4}$ miles wide called Main Passage.

Wilson Point is the southern extremity of Croker Island, being surmounted by a bare peaked rock 125 feet in height with deep water close to it.

Gisborne Point is the eastern projection of Croker Island and may be known by a round bare rock 13 feet high lying about 50 yards from it and which is steep-to. From Gisborne Point the coast trends north-northwestward 1,320 yards to Ritchie Point.

Ritchie Point.—Nearly midway between this point and the last mentioned is a group of stones 2 feet high and bold-to. The water in the bight inside these stones is also fairly deep.

Robertson Rock is a very dangerous obstruction lying in Main Passage, as the channel between Clapperton and Croker Islands is called, and is just at that distance from the former which a stranger would be apt to keep. The reef extends over a space of nearly 590 yards long in a northwest and southeast direction, the shoalest pinnacle, with only 9 feet water on it (and in low stages there may be $3\frac{1}{2}$ feet less), being in the middle and lying a little over 880 yards 54° (NE. by E. $\frac{1}{4}$ E.) from Clapperton Island Lighthouse.

At the northwestern extremity of the reef there is a second lump with 12 feet on it, and at the opposite end a third with 13 feet over it. A depth of 30 fathoms will be found on the north side of Robertson Rock, 20 fathoms between the reef and Clapperton Island, and 10 fathoms 50 yards from the shores of the latter. To avoid this obstruction vessels should keep close to Clapperton Island, and the south end of Amedroz Island should not be open northward of Cartwright Point bearing 116° (SE. by E. $\frac{1}{4}$ E.).

Buoy.—Robertson Rock is marked by a red spar buoy.

Cartwright Point is situated nearly $1\frac{1}{2}$ miles eastward of the lighthouse, and this portion of the island coast has very deep water close to it, there being 20 fathoms at 50 yards. A little over 880 yards eastward from the lighthouse is a small wharf at which supplies for the former were landed in 1885.

Browning Island is situated on the western side of the same bight and nearly 1 mile west of Shoal Island, and between the two the water is shallow.

Browning Cove.—This indentation, immediately southwest of Browning Island, contains excellent shelter from any wind in 3 to 4 fathoms, mud. The western shore of Browning Island should receive a berth of 150 yards until inside the harbor. A mud bank extends about the same distance from the west side of the harbor, but with these exceptions the shores are quite clean. On the western side and south of the muddy flat an arm runs in 440 yards, with a depth of 3 fathoms, mud.

Stanley Point, 440 yards west of Browning Island, is fairly steep-to, and from it the coast turns away southwest 1,320 yards to Oxley Point, the bight formed between them being shallow.

Oxley Point, the very westerly extremity of Heywood Island, has a flat of 3 to $3\frac{1}{2}$ fathoms extending from it in a northwest direction 440 yards.

Wharton Point is situated a little more than 590 yards southward from Oxley Point, and from it a narrow shoal spit makes out 150 yards, at which distance there is a depth of only 8 feet.

Bold Point, previously described, lies nearly 1 mile northeastward of Indian Dock Point.

Skull Point, previously described, lies nearly 1 mile east of Bold Point. A shoal indentation is between the two points. Shoal water extends about 1 mile northward from Skull Point.

Northern shore of North Channel.—George Island, previously described, is the northern side of the entrance from Georgian Bay to North Channel. It is separated from the mainland by a narrow passage called Killarney Harbor (previously described).

Kokanongwi Island, previously described, lies $2\frac{1}{4}$ miles southwest of the southwestern extremity of George Island and about 4 miles northeast of Skull Point. Kokanongwi Shingle lies east of it.

Badgeley Island has a total length of 3.6 miles, with a maximum breadth of $1\frac{1}{2}$ miles; the highest part is situated nearly 1 mile from its northeast extremity and attains an elevation of 370 feet. The southeast coast of Badgeley Island as far as High Beach is steep-to.

Maxwell Point is the northeastern extremity of Badgeley Island.

Twin Islands, 31 feet high, consist of two high bare rocks, situated 440 yards southeastward of Maxwell Point. A depth of 3 fathoms water may be carried through between Twin Islands and Badgeley Island, and deep water will be found on their east and south sides.

Badgeley Rocks, 10 feet above the water, lie a little more than 880 yards northeast by north from Maxwell Point. Between Maxwell Point and Badgeley Rocks are two sunken dangers with 5 feet water on them. There is, however, deep water between these obstructions, but, as the passage northwestward of Badgeley Island to which this would lead is not in its present state recommended, there is no object in giving directions to pass between Maxwell Point and Badgeley Rocks.

Underhill Point may be considered the northwest point of Badgeley Island, and is situated 3 miles southwestward from Maxwell Point. The shore between them is irregular and has shoals extending from it.

Evans Point is the southwest projection of Badgeley Island, and off it shoal water extends 200 yards.

High Beach Cove is situated between Evans Point and High Beach, a conspicuous white point a little over 880 yards eastward of Evans Point.

Range lights—Front light.—A fixed white light, 39 feet above water, visible 10 miles, is shown from a white, square dwelling on High Beach.

Rear Light.—A fixed white light, 61 feet above water, visible 13 miles, is shown from a brown, square, skeleton tower on the southeastern point of the island, 590 yards 75° (E. $\frac{1}{4}$ N.) from the front light.

These in range, bearing 75° (E. $\frac{1}{4}$ N.), lead 300 yards southward of Center Island Bank.

This rear light is very powerful and shows up well when approaching Killarney north of Gull Island. A bearing of it is useful to clear Bernard Rock as well as a steering mark from Cape Smith in order to pass east of Burnt Island Bank.

Shore.—The shore of the mainland has not been well surveyed therefore no description of it will be attempted.

Lobster Island.—From Le Hayes Point the mainland shore trends in a general northerly direction a little over 1 mile. Lobster Island, about 80 yards in diameter and the same distance from the shore, lies north by east 1,175 yards from Le Hayes Point; a depth of 12 feet will be found 250 yards westward from Lobster Island. The soundings on this shore are shallow, but as the water shoals very gradually and the bottom is soft, sailing vessels in beating may stand in to very little more than their draft with confidence.

Sheep Island, over 590 yards long and 440 yards in width, is the next northeastward of that on which West Lighthouse stands, and a small rock 3 feet high lies 100 yards off its southern extremity.

Partridge Island.—The island on the south point of which is situated Killarney West Lighthouse, is 150 yards long north and south by 150 yards wide. A rock just showing lies 150 yards south, a rock 2 feet high the same distance southwest, and a dry stone 170 yards westward from the lighthouse. An islet lies 300 yards westward from the lighthouse, and northwestward 100 yards from this islet is a small rock with 3 feet water on it.

No vessel should proceed north of the line running east and west through West Lighthouse, as the survey was not carried northward of this line.

Double Island is an island 17 feet high of this dual nature lying 590 yards southwest of West Lighthouse, and a small islet 3 feet high lies east-northeast 300 yards from the southeastern Double Island. There is no passage between Double Island and the lighthouse, and shallow water extends 200 yards in an easterly direction from the former.

Double Island Ledges is a dangerous patch of rocks, one of which just shows, lying nearly 1,320 yards southwestward of Double Island; the southwestern extremity, where there is a depth of 14 feet, lying 1,320 yards 264° (W.) from Fish Point.

Clearing mark.—West Lighthouse under the highest part of Leading Mark Hill, bearing 36° (NE. $\frac{1}{4}$ N.), leads southeast of these ledges.

Center Island is the next large island immediately westward of Badgeley Island. It has a total length of 2.3 miles in a west by south direction and a greatest width of 1,175 yards near its middle. The

eastern extremity is composed of three islets, the eastern of which, Harris Island, is about 200 yards in diameter and separated from Underhill Point by a deep channel 300 yards broad. At the east end of the main island there was, in 1914, a small fishing establishment.

Bayfield Reef inside the depth of 18 feet is $\frac{1}{2}$ mile long in a south-southwest direction and 200 yards wide, the depth on it being 10 feet. The southern extremity of the reef lies 1,175 yards west-northwest from Evans Point. Bayfield Reef is divided by deeper water from an extensive flat making off southward from the eastern part of Center Island.

Clearing marks.—Lion's Head Hill in range with the east side of Harris Island, bearing 16° (NNE.), leads eastward of Bayfield Reef, and the same hill in range with Underhill Point, bearing 10° (N. by E. $\frac{3}{4}$ E.), leads westward of the shoal water from Evans Point.

Center Island Bank, with 6 feet water on it, extends from the western portion of that island in a southeast direction nearly 1,320 yards, narrowing the main channel to the same distance. The southeast corner of this extensive rocky bank is situated 1.6 miles west by south from the southwest point of Partridge Island. A small patch, with 17 feet on it, lies on the latter bearing, but 440 yards farther west.

Clearing marks.—The southern extremity of Kokanongwi Island opens south of Badgeley Island, bearing 76° (E. $\frac{3}{4}$ N.), leads south of Center Island Bank and Bayfield Reef. Badgeley Island range lights in range, bearing 75° (E. $\frac{3}{4}$ N.), lead a little farther south of Center Island Bank.

Partridge (Round) Island is the western of the three, being separated from Center Island by a narrow channel, and its summit is elevated 190 feet above the water. It is 1 mile long in an east by north direction by over 590 yards wide, and its southwestern extremity is situated 3.6 miles westward from Evans Point and north by west 1.6 miles from Indian Dock Point.

Partridge Island Rocks are two small rocky patches having 12 feet water on them, situated, respectively, southeast by east 440 yards, and east-southeast 880 yards from the southwest point of Partridge Island. In addition to these, shoal water fringes the south coast of Partridge Island an average distance of 200 yards.

A small rock, with 9 feet water on it, lies 250 yards west-southwest from the west end of Partridge Island, but the northwest and north sides of the latter are steep-to.

Lansdowne Channel is the sound which separates Badgeley, Center, and Partridge Islands from the mainland peninsula, the north side of which forms the southeast shore of Frazer Bay. The greatest depth of water that a vessel can carry through this channel

is 13 to 14 feet (at low stages there may be 4 feet less), but there are so many rocky banks in it that it would be almost impossible for a vessel to get through without the assistance of several buoys. Should the amount of traffic ever warrant the buoying of this channel, a saving of $1\frac{1}{2}$ miles would be effected in the distance from Killarney to Little Current, with increased comfort to passengers by escaping the heavy sea outside Badgeley Island in southeasterly weather.

Snug Harbor.—Although Lansdowne Channel in its present state can not be navigated from end to end, yet it can safely be entered between Center and Badgeley Islands, and access had to this excellent little harbor by following these directions. Snug Harbor is situated on the mainland shore of Lansdowne Channel and is $3\frac{1}{4}$ miles from the western extremity of Partridge Island. The mouth is rather shallow, but not less than 11 feet can be carried in by keeping rather on the western side. Inside the harbor a vessel will find good swinging room in 5 fathoms over mud.

Directions.—Bring Lion's Head Hill in the gap between Harris Island and Underhill Point, bearing 13° (N. by E. $\frac{3}{4}$ E.), and so enter Lansdowne Channel, and when inside steer 328° (NNW. $\frac{1}{4}$ W.) for the entrance to the harbor; or a vessel of large draft may pick up a berth anywhere northward of Harris Island in 6 to 8 fathoms muddy bottom.

Vessels of light draft may enter Lansdowne Channel between Center and Partridge Islands.

Directions.—A small islet, with trees on it, lies in the south part of the narrow passage between these two islands and is almost joined to Partridge Island; and 150 yards northward of this there is a small bank of stones 2 feet high. These narrow the channel between them and Center Island to 100 yards. A rock, with 7 feet water, lies 40 yards southward from the bank 2 feet high just mentioned, and between the latter and Partridge Island there is 12 feet of water (in low stages there may be 4 feet less).

To pass through between Partridge and Center Islands, open the passage and steer for it, bearing 356° (N. $\frac{1}{4}$ E.) with not less than 3 fathoms. Keep Center Island on board until past the bank 2 feet high, when bring the latter in range with the bushy hill on Manitoulin Island $1\frac{1}{2}$ miles back of Indian Dock—known as the Spur—bearing 176° (S. $\frac{1}{4}$ W.). This will carry a vessel over the bar with not less than $3\frac{1}{4}$ fathoms. A vessel may anchor on the latter range in this depth over mud, when the south side of Heywood Island is well open north of Partridge Island.

Creak Island is at the southwestern extremity of the peninsula which separates Lansdowne Channel from Frazer Bay. The island is divided from the peninsula by a boat channel through which 4 to

5 feet can be carried by keeping the east shore on board. A rock with 2 feet water on it, lies 150 yards from the south point of Creak Island, and between is a depth of 12 feet.

Richards Reef, 8 feet high, is situated nearly 200 yards westward of Creak Island, and between them $4\frac{1}{2}$ fathoms may be carried in an emergency.

Boat rock is a shoal spot with 6 feet water on it, lying 350 yards westward of Richards Reef; it is surrounded on all sides by deep water.

Steamer Reef, with 13 feet water on it, lies 590 yards southwestward from Richards Reef. To lead westward of both these dangers, keep the east fall of Wekwemikong Hill open west of the southwestern extremity of Partridge Island, bearing 172° (S. $\frac{1}{8}$ E.).

Frazer Bay.—This fine sheet of water is entered from the southwest between Mary Point—the southeastern extremity of Little Cloche Island—and Creak Island already described. The absence of traffic did not justify the survey being pushed any farther than to the east and west line, passing 880 yards northward of Mary Point. Since the survey of this portion of the coast in 1885, minerals have been discovered 35 to 40 miles inland, and no doubt but an extension of the survey 2 or 3 miles farther northward would show that a suitable port exists for the shipping of ore.

Southeast Shore—Gibson Point.—From Creek Island the shore trends in an east-northeast direction a little over 1 mile to Gibson Point, immediately westward of which a cove runs in 440 yards.

Boyle Cove is situated east of Gibson Point, and is 440 yards in length by 300 yards in breadth, containing shelter in all but northerly winds, in 5 fathoms mud. A spot with not less than $3\frac{1}{4}$ fathoms lies a little north of the entrance. From this cove, the coast trends in a northeasterly direction a little over 1,320 yards to Mayes Point, and is steep-to.

Limestone Point is low and flat, and being composed of rock of this nature, contrasts strongly with the formation of the surrounding country. The east side of this point is steep-to, but on the west side is an extensive rocky bank with 12 to 15 feet water over it, stretching 440 yards from shore.

Deepwater Island, 48 feet high, lies 1,320 yards northeastward from Limestone Point, and with the exception of a spur which makes out 100 yards from its southwest point, has deep water on all sides.

Quartz Rock, small and bare, and 9 feet high, is situated 440 yards northeastward of Deepwater Island, and is fairly steep-to on all sides.

Lions Head and Rump are two elevations 453 and 470 feet high, respectively, which together form one hill in the middle of the penin-

sula in this locality, having from the southward somewhat the form of that animal when lying down. The Head serves the purpose of a leading mark to clear various shoals.

South Coast of Cloche Islands.—The southeastern portion is known as Little Cloche Island, being divided from Great Cloche Island by a narrow boat channel named Southwest Gut, through which there is a perceptible current. Little Cloche Island is nearly 3 miles long in a north by west direction and over $1\frac{1}{2}$ miles in greatest diameter.

Mary Point.—This point, which may be called the western entrance point of Frazer Bay, is situated $3\frac{1}{2}$ miles north-northwest from the western end of Partridge Island. It can be approached from the southeast to 300 yards, but, from the coast 440 yards north-northeast of the point, shoal water extends eastward the latter distance, where there is a depth of 15 feet. From Mary Point shallow water extends 880 yards south by west.

East Mary Island, low and wooded, 300 yards long northwest and southeast by 200 yards broad, lies 1,175 yards southwest by west from Mary Point. Its north and east sides are steep-to, but a bank extends 880 yards in a southerly direction with depths varying from 12 to 18 feet. The west and southwest sides of this island should not be approached nearer than 440 yards.

West Mary Island, low and less wooded than the last mentioned, has a maximum diameter in a northeast direction of 880 yards. Like East Mary Island, its northeast, north, and northwest sides are steep-to, but from the southern side and southwestern point a rocky bank extends southward 590 yards and southwestward 1,320 yards. A patch of stones 1 foot high lies 590 yards west-southwest from the southwestern point of West Mary Island. No natural features offer for a clearing mark for the banks south of the Mary Islands; care should be taken, therefore, if standing toward them in a sailing vessel to tack in 6 fathoms. A passage 440 yards broad exists between the banks from these islands by keeping rather nearer East Mary Island.

A channel of the same breadth exists between them and the shoal water from Little Cloche Island by keeping the northern sides of Mary Island on board.

Anchorage may be had either in or off the mouth of the cove on the northern side of West Mary Island.

From Mary Point the southwest coast of Little Cloche Island trends in a general west-northwest direction 2 miles to the island in the entrance to Southwest Gut, on either side of which there is a passage for a boat. Shoal water extends from this coast for an average distance of 590 yards, and off the entrance to the gut, the flat extends 880 yards.

Cloche Bluff, 220 feet high, is a rocky eminence on the southern extremity of Cloche Peninsula, the southeast fall of which serves for clearing marks already given.

Stony Point the most southerly point of Great Cloche Island, is the termination of the peninsula 1 mile long and 1,175 yards broad, situated 3 miles westward of Mary Point and a little over $1\frac{1}{2}$ miles eastward of Strawberry Island Lighthouse. As the name indicates, scattered boulders lie off the shore for 100 yards, and a shallow, rocky bank extends southward 590 yards.

Shoal Bight, as the bay between Southwest Gut and Stony Point is called, is foul and shallow for more than 880 yards. The eastern side of Stony Point itself, however, is fairly steep-to. A depth of 6 to 7 fathoms with a breadth of 1,320 yards will be found between the shoal water south of Stony Point and the bank from West Mary Island.

English Point on Great Cloche Island is situated $1\frac{1}{2}$ miles northwest from Stony Point, and between them a very shallow cove runs in 590 yards. Shoal water fringes the shore an average distance of 440 yards.

An isolated rocky bank with 12 feet water on it is situated nearly midway between Stony Point and McKenzie Island.

McKenzie Island 3 feet high, with a few small trees on it, lies east-northeast a little over 1 mile from Strawberry Island Lighthouse. A detached reef of stones 2 feet high lies north by west 440 yards from the island. From McKenzie Island shoal water makes out 300 yards in a southerly direction.

The eastern and western sides are fairly steep to, leaving a channel 590 yards wide with depths 5 to 6 fathoms between it and English Point and another between it and Garden Island nearly 1,320 yards wide with a depth of 7 fathoms.

Garden Island—as the barren limestone island 9 feet high, lying 880 yards northward of Strawberry Island Lighthouse, is rather inappropriately called, is nearly 590 yards long by 250 yards broad. Its northeast, north, and northwest sides are steep to.

Garden Island Bank with 3 feet water on its southeastern part, is a dangerous rocky flat extending from the south shore of Garden Island to within 350 yards of Strawberry Island Lighthouse, but the northeast, north, and northwest sides of the island are steep to.

The coast of Great Cloche Island west of English Point runs generally in a westerly direction as far as Beauty Island, and is indented by several rocky coves and inlets, and the whole coast is fringed with boulders and shallow sunken rocks. For 2 miles westward from English Point a bank extends off from the coast an average distance of over 590 yards, while from this to Beauty Island there is only a depth of 12 feet at nearly 1 mile from the coast.

The shore of Great Cloche Island west of Beauty Island and to Flat Island has been described in connection with the description of Little Current.

North and west shores of Great Cloche Island—Hunt Point.—The survey was not taken eastward of a line joining Hunt Point of Great Cloche Island and Eastern Island on the north shore, the northeastern extremity of which is situated a little over 4 miles west-northwestward from Hunt Point, as navigation without local knowledge is here at an end on account of the many sunken rocks to be met with eastward of this line. A vessel bound to Whitefish River should not proceed without a pilot any farther east than the point 440 yards west of Hunt Point, as between these two shoal water extends from the shore 200 yards. An islet lies 300 yards northward of Hunt Point and a rock with 12 feet water on it lies 100 yards southwest from the islet.

Alert Point lying about $2\frac{1}{4}$ miles west of Hunt Point forms the east entrance point of Sturgeon Cove, the dry rock off the point being 3 feet above the water, and shoal water extends from the little dry rock 150 yards. Two open coves lie 880 and 1,320 yards eastward of Alert Point.

Sturgeon Cove is a well sheltered bay situated just west of Alert Point. This cove has excellent shelter in 2 to 3 fathoms muddy bottom, but its narrow entrance is so obstructed by a rock with 7 feet water in 1885 on it as to render it unsafe without buoys for the entry of any but very small craft.

Bell Cove is a wide indentation immediately westward of Sturgeon Cove and is separated from it by a narrow peninsula, the northern extremity of which should not be approached nearer than 200 yards. There is anchorage in 7 and 8 fathoms over mud.

Neptune Island.—Neptune Island is situated about 1,320 yards westward of Alert Point and is separated from the main island by a boat channel. The islet situated midway between Boat Cove and Neptune Island should receive a berth of 150 yards.

Northwest Point has an open cove on its southeast, and an excellent boat harbor known as Boat Cove on its northeast side. The coast between Neptune Island and Northwest Point trends nearly east and west and is quite irregular.

Halfway Islands, two in number and 15 feet high, lie 440 yards westward of Northwest Point, and the channel between them and the latter is deep.

Coast.—From Northwest Point the western coast of Great Cloche Island trends southward to Flat Island, forming the eastern side of Wabuno Channel; this whole low limestone shore may be approached to 100 yards.

Carpmael Island, 17 feet high, lies nearly 1.6 miles northwestward of Hunt Point. Two dry rocks lie close west of it, the south side of which, as well as the island, may be approached to 100 yards.

Gordon Rock, a group of stones 5 feet high, lies over 590 yards west by north from Carpmael Island, and the passage between is shallow.

Luard Rock, with 12 feet water on it, lies northeast by east $1\frac{1}{2}$ miles from the northern Halfway Island.

Moberly Rock, with 9 feet water over it, is situated 2 miles westward from Carpmael Island.

Oliver Rock, with 15 feet water on it, lies the same direction $1\frac{1}{2}$ miles from Carpmael Island.

Eastern Island derives its name from being the most easterly island of this group extending eastward from the Indian village of Sagomuk. The eastern extremity of this island lies $2\frac{1}{4}$ miles north-northeast from Halfway Islands of Wabuno Channel.

High Island, so called from its high wooded summit elevated 186 feet, is situated 200 yards westward of Eastern Island. A bare rock 10 feet high lies about 50 yards south of its western extremity, and is steep-to. The remainder of the south coast of both these islands may be approached to 150 yards.

Perley Island, 590 yards long and 200 yards in breadth, is the next island westward of High Island, being separated therefrom by a channel 440 yards broad, in the southern part of which there is a depth of 6 to 9 fathoms. A rock with 6 feet on it lies 150 yards northwestward from the western extremity of Perley Island, but its south shore is steep-to.

Kirkpatrick Island is the larger and westernmost of the two small islands west of Perley Island, and which are almost connected by dry stones. The southeast coast of Kirkpatrick Island, as well as the south coast of the little island eastward of it, may be approached to 150 yards.

Louisa Island has a maximum length of 880 yards; it is situated nearly that distance westward of Kirkpatrick Island, and both may be recognized by the two small dry rocks lying southward of the passage between these islands, the eastern rock being 6 feet and the other 3 feet high.

Louisa Rocks.—The eastern one is connected to Kirkpatrick Island by a bank, and 150 yards southwestward of it is a rock with 13 feet on it. The water is shoal between the western one and the southeast point of Louisa Island, but with these exceptions the water is good between them.

Tupper and Galt Islands lie next westward of Louisa Island. The former and southern island has a stone which just shows above the water, lying 200 yards southeast of it.

Barren Island, the western one of the above subgroup, is situated over 1 mile east-southeast from the Hudson Bay Co.'s wharf on Hog Island.

Channel Island, about 30 feet high and the easternmost of the group lying off Fort la Cloche, derives its name from the fact of its being the little island that vessels pass close round the north side of when approaching wharf on Hog Island from the eastward.

Channel Island is separated from Barren Island eastward of it by a passage nearly 1 mile broad, and on the line joining Channel Island to the south point of Barren Island from 12 to 15 fathoms will be found right across. Vessels should not proceed farther north than this line, as a reef with as little as 1 foot of water on it (in low stages it will be dry) lies 880 yards eastward from the east end of Channel Island; another sunken rock with less than 6 feet water on it lies east by north, 440 yards from the same.

Nisbet Rock, 3 feet high, lies 350 yards northeast from the east end of Channel Island, and between them is the channel by keeping rather nearer the island.

Hog Island lies immediately westward of Channel Island and is 1,320 yards long, with an average breadth of 150 yards; on its eastern extremity is situated a small wharf, on which goods are landed for the post at Fort la Cloche, 2 miles in a north-northwestern direction therefrom. Small tugs can proceed to the mouth of the stream which flows past the post, anchoring in the shallow but well-sheltered bay into which this stream empties itself.

In 1886 a considerable quantity of logs were brought down this stream and rafted to the sawmills at Little Current. At the wharf on Hog Island 12 feet water may be had with perfect shelter from all winds; good water may be had all along the north side of Hog Island and between it and McRae Island, 300 yards from the middle of its north side.

Jenkins Rock, 2 feet high, lies 200 yards northeastward of the west end of Hog Island.

Round Island, 150 yards in diameter, lies 300 yards northwestward of Hog Island, and although 12 feet was carried between them by keeping nearer the former, the extensive bank of shoal water southwestward of it (see below) nullifies the use of this passage.

Lampey Rock, 7 feet high, lies 150 yards northward, and **Mann Rock**, 3 feet high, 200 yards northwestward of Round Island. Both these rocks lie on the north side of the channel leading to Hog Island Wharf from the west.

A small islet 4 feet high is situated 200 yards west-northwest from the middle of Round Island, and between them there is a depth from 3 to 4 fathoms, but by reason of the shoal bank this passage serves little purpose.

Chatwin Rock, round, smooth, and 7 feet high, marks the east side of the entrance to the back channel to Hog Island Wharf; it is 200 yards westward of the small islet last mentioned, the two being joined by sunken rocks.

A rock with only 1 foot of water on it (in low stages it will be dry) lies nearly 200 yards northwest from Chatwin Rock, and between them is the channel in which a vessel can find 18 feet water, passing about 100 yards from Chatwin Rock.

Matheson Island is situated nearly 1 mile west-northwest from Hog Island, its southeast point being marked by a dry stone, and a sunken rock 50 yards southeast of the same.

Hog Island Bank takes its name from the island, off the southwestern extremity of which it extends nearly 1,320 yards in a southwesterly direction; and westward quite 1,320 yards. Near its most southern extremity is Belcher Rock with only 4 feet water on it, 880 yards southwest from the west point of Hog Island.

Hewett Rock, with 18 feet water, lies 1.1 miles 211° (SW. $\frac{1}{2}$ S.) from the southeastern end of Hog Island.

Pacific Shoal, with 5 feet water over it, and situated near the western extremity of this bank, lies a little over 590 yards south-southwest from Chatwin Rock. To pass southward of the whole of this bank, keep the entrance to McBean Channel open southward of Solomon Point, bearing 291° (NW. by W. $\frac{1}{2}$ W.).

McTavish Island may be recognized as being the most outstanding island in this neighborhood; it is 880 yards in length, and its south and east sides are steep-to. Its southeast point is situated $1\frac{1}{2}$ miles east-southeast from Solomon Point and $1\frac{1}{2}$ miles westward from Chatwin Rock. There is a passage for boats and possibly small tugs between this island and the chain of islands 440 yards north of it.

Directions for Hog Island Wharf.—From the west, steer to pass 880 yards southward of the east end of McTavish Island, in which position the gap in Notch Hill will be over and in range with Chatwin Rock, bearing about 69° (ENE. $\frac{1}{4}$ E.). This mark will lead 200 yards northwestward of Hog Island Bank and 150 yards southeastward of the spit from the east end of Matheson Island. Leave Chatwin Rock 100 yards on the starboard hand and steer about 105° (ESE. $\frac{1}{4}$ E.), passing southward of Mann, Lampey, and Jenkins Rocks, 70 yards north of Round Island, and 100 yards from the north shore of Hog Island, until the wharf at the extreme east end of the

island is reached; the shoalest water, of 18 feet (1885), will be found while rounding Chatwin Rock.

If approaching south of Hog Island Bank and Belcher Rock pass 880 yards northward of Bourinot Island and bring the north side of Barren Island to touch the distant north shore, bearing 82° (E. $\frac{1}{4}$ N.), which mark will lead 440 yards southward of Belcher Rock and 300 yards from Channel Island; give the east side of the latter a berth of 100 yards, when, if necessary, the north side of Channel Island may be approached to a less distance (the water being good) for the convenience of taking the wharf.

East Rous Island is the next large island west of Great Cloche Island; it is over 2 miles long and has a maximum width of over 1 mile, being separated from West Rous Island by a boat passage known as Rush Channel.

Schreiber Island, 54 feet high, lies 440 yards northward of East Rous Island, and its north and northeast sides are steep-to. A rock with 3 fathoms on it lies 250 yards westward of Schreiber Island, and less than 100 yards from its southeast point is an islet 6 feet high from which shoal water extends southward and eastward 100 yards.

A reef with 4 feet on its northern extremity stretches 250 yards from the north point of East Rous Island in the direction of the west side of Schreiber Island, narrowing the channel with a depth of 3 fathoms to less than 100 yards. With the assistance of temporary buoys this passage was used a great deal by the *Bajfeld* in the course of the survey in 1885 as a short route to the excellent anchorage under Bedford Island, but without such aid the channel should not be attempted. The whole east side of East Rous Island as far as Palliser Point is bold and may be approached to 100 yards.

Mink Island is the largest and easternmost of a group of islands situated south of East Rous Island, and between it and Palliser Point a vessel will find good anchorage in 5 to 6 fathoms over mud. A small islet 2 feet high lies 300 yards southeastward from Mink Island and may be approached to 200 yards.

Blake Island, 10 feet high, is the southernmost of this group, but the timber with which it is at present (1885) covered gives it, as well as many more of the islands—which otherwise would be scarcely discernible at night—a much greater apparent height. The south side of Blake Island may be approached to 200 yards. Some small islets lie 300 yards northward of Blake Island, and between these and Mink Island a depth of $3\frac{1}{2}$ fathoms may be carried in an emergency by keeping midway between them.

West Rous Island is fairly steep-to on its northern side, but on all others has shoal water.

Fish Creek Point is the name given to the southwest extremity of the island, and contains on its north side a snug little boat cove.

Half a mile southeastward of Fish Creek Point are two small islands with a bank extending from them southward 200 yards. A very shallow, rocky spit makes out westward from Fish Creek Point, and a bank with 9 to 13 feet on it extends southward from it 590 yards. A vessel standing northward toward this group should not lose sight of Elm Island, which in range with Straubenzee Point of Bedford Island, bears 281° (W. by N. $\frac{1}{2}$ N.). The passage between West Rous and Bedford Islands is fit only for small boats, there not being more than 6 feet.

Bedford Island is the next large island westward of the Rous Islands, its greatest diameter being $3\frac{1}{4}$ miles.

Straubenzee Point is the southwestern extremity, and from it the dangerous Straubenzee Reef extends nearly 1,320 yards in a southwesterly direction, with as little as 3 feet water on it.

Strange Bay is a shallow open indentation 880 yards in diameter immediately northward of Straubenzee Point.

Strange Point is nearly 1 mile northward of Straubenzee Point, and from the southern part of it shoal water extends 1,175 yards. At the northern part of Strange Point the deep water comes close to shore and continues along the whole of the northwest and north coasts of Bedford Island. At $1\frac{1}{4}$ miles in this direction from Strange Point will be found a snug little cove, called Landing Beach, where a boat can land in heavy southwesterly weather.

Bedford Island Reef is a dangerous piece of rocky ground, extending over 1,175 yards from the northwest side of Bedford Island. There are four separate spots, the shoalest being nearly level with the surface. The western and outer rock, with 3 feet of water on it, bears 13° (N. by E. $\frac{3}{4}$ E.), distant $1\frac{1}{2}$ miles from Strange Point.

Clearing marks.—No vessel should attempt to pass inside this extensive reef, but if from the southwest a vessel will pass northwestward of all these patches by keeping the north point of Elm Island touching South Point of Clapperton Island bearing 235° (SW. by W. $\frac{3}{4}$ W.).

The west end of Wabos Island, just open of the west side of Bedford Island, bearing 186° (S. by W. $\frac{1}{4}$ W.) is also a safe mark for clearing the west side of this shoal, the south side of Five Islands in range with Macpherson Ledge, bearing 103° (ESE. $\frac{1}{4}$ E.) leads 440 yards northward of the whole of these patches.

Macpherson Ledge consists of two dry rocks—the eastern and higher of which is 4 feet high—200 yards apart, and a rock with 3 feet water over it lying the same distance farther west. The ledge lies 300 yards from the northeast point of Bedford Island and 1,175 yards westward of Five Islands and has good water all around it.

Five Islands are composed of that number of islands, great and small, and are situated midway between the north points of East

Rous and Bedford Islands. They cover a distance of over 1,320 yards in a nearly east and west direction, leaving a good passage between them and Macpherson Ledge into Bedford Harbor.

Ten Foot Rock, with that depth of water over it, lies 440 yards northward from the eastern of the Five Islands Group, the south sides of which should receive a berth of 300 yards.

Bedford Harbor is contained between Five Islands on the north, Rous Islands on the southeast, and Bedford Island on the west, and contains excellent anchorage in any depth under 9 fathoms. The best berth is under Wise Point, of Bedford Island, and 440 yards offshore in 3 to 4 fathoms. The harbor is entered between Macpherson Ledge and Five Islands, taking care to pass 300 yards eastward of Wise Point, off which a bank extends nearly 300 yards in a north-easterly direction.

Bear's Back Island lies midway between the southern portions of Bedford and Amedroz Islands. It is 1,175 yards long southwest and broken up by several indentations, particularly on the south side, where there is an excellent little harbor for boats or small tugs drawing less than 7 feet; its east and southeast sides are steep-to.

Bear's Back Shoal extends 590 yards from the western low side of Bear's Back Island to the depth of 3 fathoms, but at half this distance there is a spot with only 3 feet water on it. The north-eastern extremity of Clapperton Island, in range with the south-west side of Amedroz Island, bearing 296° (NW. by W. $\frac{1}{2}$ W.), leads southwest of this shoal.

Tilley Rock, with 8 feet water on it, lies 440 yards northwest from the northern extremity of Bear's Back Island, and a rock with 3 feet on it lies 150 yards from the same north point.

Sullivan Patch, with a least depth of $3\frac{1}{2}$ fathoms, is 1,175 yards northward from the north point of Bear's Back Island. South point of Clapperton Island, in range with the northern extremity of Elm Island, bearing 235° (SW. by W. $\frac{3}{4}$ W.), leads northwestward of Tilley Rock and Bear's Back Shoal.

Elm Island, so called from a single tree of that nature growing on it in 1885, but since disappeared, is a narrow bank of stones 7 feet high and 200 yards long, situated nearly $1\frac{1}{4}$ miles west-southwest from the southwestern extremity of Bear's Back Island.

Elm Island Bank, with 6 to 12 feet water over it, extends 440 yards north-northeast and northwestward from Elm Island; its other sides may be approached to 200 yards.

Lansdowne and Lorne Rocks, with 17 feet water on them, lie, respectively, southeast by east 1,175 yards and east by north 1,320 yards from Elm Island.

Clearing marks.—A vessel may carry 5 fathoms between Bear's Back and Elm Islands by keeping the northeast side of Clapperton

Island, touching the southwest point of Amedroz Island, bearing 296° (NW. by W. $\frac{1}{2}$ W.). The bare, rocky summit of Wilson Point (Croker Island) open southwest of Amedroz Island, bearing 321° (N. NW. $\frac{1}{2}$ W.), leads southwestward of Elm Island Bank.

Amedroz Island lies nearly $1\frac{1}{2}$ miles northeastward of Clapper-ton Island, its greatest diameter being $2\frac{1}{2}$ miles.

Todd Shoal extends from Todd Point (the eastern extremity of Amedroz Island), 590 yards north-northeast, where there is a depth of 13 feet. The same depth will be found 300 yards eastward of Todd Point, while from the southeast sharp extremity of the peninsula a reef extends in a southeasterly direction 200 yards.

Middleton Islands.—From the last mentioned locality, the coast of Amedroz Island trends west-southwest 1 mile, forming a bight with good water in it, to Middleton Islands, two in number, the western one being the larger. A rock with 13 feet water on it lies 200 yards eastward of these islands and a passage 200 yards wide with depth of 11 feet separates these islands from the main island. From Middleton Islands the coast continues in the same direction 1 mile to Carleton Point.

Carleton Point.—This low southern extremity of Amedroz Island and the shore eastward of it for 1,175 yards are fringed with shoal water for 300 yards.

Magee Point is situated over 1,320 yards northwestward from the last mentioned, inclosing between them a long shallow indentation, known as Reedy Bay, in the mouth of which are two islets. Between them and Magee Point a small craft may find temporary anchorage in 10 or 12 feet water.

Magee Bank is the rocky flat extending nearly 440 yards southward from the islets above mentioned and Carleton Point. The whole of Croker Island open southwestward of Amedroz Island, bearing 333° (N. by W. $\frac{1}{2}$ W.), leads west of this bank.

The central and gravelly projection of Magee Point should be given a berth of 200 yards. From the north part of this point the northwest side of Amedroz Island runs northeastward $1\frac{1}{2}$ miles to the western part of Robinson Point—the most northerly projection of Amedroz Island. This coast is fairly steep-to and may be safely approached to 200 yards.

Bourinot Island is situated over 1,320 yards eastward of Robinson Point; it has an average diameter of 590 yards, and its coast is indented by several small coves.

Bourinot Reef with 9 to 12 feet water over it, extends 590 yards north-northeast from Bourinot Island, and great care should be taken in passing this dangerous reef, as no clearing mark could be obtained to lead a reasonable distance northward of it.

A **bank** extends the same distance south and southeast from Bourinot Island; but the east and west coasts of the island may be approached to 200 yards. A vessel of not more than 10 feet draft can pass between Amedroz and Bourinot Islands from the southeast by giving Todd Point a berth of from 200 to 300 yards, keeping Robinson Point a little on the starboard bow to bring that point in range with the northwest side of Croker Island bearing 303° (NW. $\frac{1}{4}$ W.). This mark kept ahead will lead south of the shoal water from Bourinot Island, which, being past, the coast of Amedroz Island may be approached to 100 yards.

Fleming Bank, with 9 feet water on it, is a dangerous shoal bearing 300° (NW. $\frac{1}{4}$ W.) 1.6 miles from the northwest point of Bourinot Island. The bank lies northwest and southeast, and under the depth of 3 fathoms is over 590 yards in length.

Clearing marks.—The south fall of White Mountain in range with the west end of Hog Island, bearing 82° (E. $\frac{1}{4}$ N.), leads north, and the same hill in range with east end of that island, bearing 77° (E. $\frac{1}{4}$ N.), leads south of Fleming Bank. Todd Point (Amedroz Island) touching the southwestern extremity of Bourinot Island, bearing 130° (SE. $\frac{1}{4}$ S.), leads 150 yards southwest of this bank.

Solomon Point is the southwest point of the peninsula on which the Indian village of Sagomuk is situated; a sand bank extends 200 yards from Solomon Point and the same distance from the western extremity of McTavish Island, and a vessel should not stand into the bight northward of a line joining these two positions.

Sagomuk, the Indian village situated on Solomon Point, is $3\frac{1}{2}$ miles westward of Fort la Cloche. A small vessel of 6 or 7 feet draft can find anchorage near the village in 9 to 12 feet of water over a sandy bottom.

Stewart Island is small and wooded, having a dry reef 50 yards west of it and a dry rock close to its east side. It lies 590 yards northwestward of the south part of Solomon Point, and between them there is a depth of 12 to 15 feet over sand. A bank extends 300 yards southward from Stewart Island.

Linter Island is slightly smaller than Stewart Island, and situated 300 yards west of it. A dry reef lies 100 yards northwest of the island and two other dry rocks lie between it and the shore. The deep water of the channel approaches close to the south side of Linter Island.

Bacon Island is close to the shore and situated 1.1 miles westward of Sagomuk, and is fairly steep-to. From this island the coast trends northward 440 yards and then northwestward over 1,175 yards in a series of small coves, and should not be approached nearer than 250 yards. The coast is now broken up into a number of small islands and rocks.

McBean Channel is the passage leading from Fox Island to Aird Island. The eastern entrance to this channel may be said to lie between Fox Island on the south and a bare rock on the north, called from its appearance Bald Rock.

Bald Rock.—This loaflike looking rock is 15 feet high, and lies 880 yards northwestward from the east end of Fox Island.

East Rock.—From Fox Island (the easternmost large island on the south side of McBean Channel) a string of dry rocks extends 1.2 miles in a southeasterly direction, terminating in East Rock. This rock, 6 feet high, with a few stunted trees on it, lies the same distance westward of Solomon Point and 880 yards southwestward of Linter Island, and between them is the passage of 13 to 14 fathoms water, leading to McBean Channel.

A rock awash lies 590 yards south by west from East Rock, a dry stone 150 yards north by west of it, and a rock with 7 feet water over it lies 300 yards southeast from the same.

West Rock is of similar character lying 440 yards southeastward from the southeastern extremity of Fox Island. Between West and East Rocks are two other dry rocks with shoal water about them. In addition to West Rock itself, which is 6 feet high, a stone lies 250 yards southeast and another 100 yards west of it. A rock with 6 feet water on it lies nearly 880 yards southeast from West Rock.

Ritchie Rock with 11 feet water on it, is situated nearly 1,175 yards 191° (S. by W. $\frac{1}{2}$ W.) from West Rock, and $1\frac{1}{4}$ miles 9° (N. by E. $\frac{1}{4}$ E.) from Gisborne Point of Croker Island.

A passage with depth of 21 feet exists between West Rock and Fox Island, to lead to which from the southeast bring Bald Rock open its breadth east of Fox Island, bearing 346° (N. $\frac{3}{4}$ W.), and steer for it, leading east of Ritchie Rock and giving Fox Island a berth.

CHAPTER XIV.

NORTH CHANNEL ENTRANCE TO GEORGIAN BAY.

The low water of 1895 (579 feet above mean tide at New York) was $3\frac{1}{2}$ feet below the datum used in this chapter.

This chapter describes the southern shore from Cape Smith to Indian Rock Point and the northern shore from Killarney to Gron-dine Point including the islands and shoals between these shores.

Cape Smith forms the southeast entrance point of the bay of that name, at the head of which is situated the Indian village of Wek-wemikong. The cape is rendered conspicuous by the sudden termination of the clay bank which culminates here in a height including the trees of 370 feet. The northeastern extremity of the cape is 17 miles 338° (N. by W. $\frac{3}{4}$ W.) from the east point of Lonely Island; and 12 miles 202° (S.W. $\frac{1}{4}$ W.) from Killarney East Lighthouse, and may be passed at 200 yards in a depth of 5 fathoms.

Campbell Rock with 12 feet water on it (and in low stages there may be 4 feet less) lies $2\frac{1}{2}$ miles northeastward from the northeastern extremity of Cape Smith, and for a heavy draft vessel in a southeast sea, this is an ugly danger.

Buoy.—A spar buoy painted in red and black horizontal bands marks this rock.

Clearing marks.—Horsburgh Point, just open southeast of Clay Cliff bearing 211° (SW. $\frac{1}{4}$ S.), leads 1,175 yards southeastward; and the south side of Papoose Island touching the north side of Young Squaw 80° (E. $\frac{3}{4}$ N.), leads northward of the rock.

The south side of Papoose Island touching the north point of Squaw Island bearing 77° (E. $\frac{3}{4}$ N.) leads close south of Campbell Rock.

From the northwest prong of Cape Smith, the south shore of Cape Smith Bay trends southwest by west 1,320 yards to East Red Cliff, and $1\frac{1}{2}$ miles to West Red Cliff.

Red Cliff Flat.—Between the two prongs of the cape the shore is shallow for 300 yards; southwestward of this the bank gradually widens until northwest from East Red Cliff it attains a breadth of 1,320 yards with depth of 9 to 12 fathoms.

Sturgeon Point.—From West Red Cliff the coast trends westward 2 miles to Sturgeon Point, forming three long, shallow bights. Shallow water extends 300 yards northeastward from Sturgeon

Point, and thence continues eastward to the outer part of Red Cliff Flat. Good anchorage may be had 1,320 yards northwest of West Red Cliff in 6 fathoms, muddy bottom, by keeping North Point of Squaw Island well open north of Cape Smith, the latter bearing 75° (E. $\frac{3}{4}$ N.).

Gold Hunter Rock, with 6 feet over it, is a very dangerous obstruction to the navigation of Smith Bay, and lies northwest by west, 1 mile from the northwest prong of Cape Smith. It is a circular patch of small boulders, 200 yards in diameter.

Clearing marks.—The two prongs of Cape Smith in one bearing 102° (ESE. $\frac{3}{4}$ E.) lead south of it. The top of Badgeley Island in range with the east side of Big Burnt Island bearing 10° (N. by E. $\frac{1}{2}$ E.) leads west of Gold Hunter Rock. The north fall of the Spur in range with the middle of the high portion of William Island bearing 326° (NNW. $\frac{1}{2}$ W.) leads northwestward of this rock. The west end of Bushy Clump open east of the east end of West Red Cliff, 189° (S. by W. $\frac{3}{4}$ W.) leads westward of it.

Doyle Rock, with 22 feet on it, lies a little over 1 mile westward of Gold Hunter Rock.

From Sturgeon Point the southern shore of Smith Bay runs westward $2\frac{1}{2}$ miles, when it turns north to the village of Wekwemikong, forming the bottom of the bay $1\frac{1}{2}$ miles broad. The southern portion of the latter should not be approached nearer than 880 yards, nor the village to less than 440 yards.

Wekwemikong is situated on the rising ground in the northwest corner of Smith Bay; a path connects it with James Bay, and a carriage road communicates with Manitowaning. With the exception of the roman catholic missionaries and teachers, the population is entirely Indian, amounting in the year 1911 to 450. There is a small boat pier here, but no wharf suitable for a vessel.

From the village, the north coast of the bay trends in a northeasterly direction 3 miles to Nadeau Point, and from the southwestern half of it a bank extends 880 yards, at which distance there is but 10 feet water.

Clearing mark.—To pass southeastward of this bank, keep the southeastern point of Big Burnt Island closed with the northwestern point of William Island, the latter bearing 40° (NE. $\frac{1}{4}$ E.).

William (Whisky) Island is situated on the northwest side of Smith Bay. It is 880 yards long in a northeast direction, with greatest breadth of 200 yards at the southwestern extremity. Shallow water with rocky bottom extends 440 yards southeastward and southwestward 200 yards from the south point of William Island. The northwestern side of it may be approached to 100 yards.

Pelkie Rock with 8 feet water on it (in low stages there may be 4 feet less), is an important danger to vessels entering the bay from

the north. It is an isolated shoal 590 yards long northeast and southwest, and 200 yards broad, with its southern end situated 1.1 miles eastward from the southern point of William Island.

Clearing mark.—The summit of Badgeley Island well open east of Big Burnt Island, the eastern extremity of the latter bearing 358° (N. $\frac{3}{4}$ E.) leads east of Pelkie Rock.

Frank Ledge, with 5 feet water on it, corresponds very nearly in shape and size to the last-mentioned danger. Its northern end is situated 1,175 yards southeastward from West Mound and 880 yards southward from the southern point of William Island.

Clearing mark.—West fall of Leading Mark Hill (Killarney) in range with the southeastern point of Big Burnt Island, bearing 28° (NE. by N.) leads eastward of this ledge.

West Mound is a gravelly bank 3 feet high lying 880 yards southwestward of William Island, and from it shoal water extends in a southerly direction 590 yards, to the eastward 250 yards, and to the northward 440 yards, leaving a 4-fathom channel 350 yards broad between it and William Island.

In addition to the bank which makes out northward of West Mound itself, two other shallow patches, almost joined, lie 1,320 yards in a northerly direction from it. On the northern shoal there is less than 1 foot of water, and, to avoid these shoals, vessels should keep within 440 yards of the southwest part of William Island.

East Mound is a somewhat similar little bank 2 feet above the water, and lying eastward 440 yards from the northeast point of William Island, with no passage between. Shoal water extends 300 yards in a northeasterly direction from East Mound, almost joining a bank with 13 feet water over it.

Nobles Bank.—The northeastern edge is 1,175 yards from East Mound and nearly 1 mile from William Island.

Clearing mark.—The north fall of The Spur in range with the southwestern side of Hog Island, bearing 301° (NW. $\frac{1}{4}$ W.) leads northwestward of this bank and Pelkie Rock.

John Ledge, the shoalest part of which has only 3 feet on it, has a total length of 1,175 yards in a northeasterly and southwesterly direction. Its southwestern edge lies 440 yards northwestward from East Mound, the channel between being reduced to 200 yards with least depth 21 feet.

From Nadeau Point on the Manitoulin Shore, the shore trends 14 miles northward to Fishing Island Cove, a snug boat harbor protected by Fishing Island. In addition to the two banks northward of West Mound, shoal water extends from the shore an average distance of 440 yards. From Fishing Island Cove, the stony, shallow and broken up shore trends in a general northerly direction nearly 2 miles to Prairie Point, leaving to the east a group of islands known

by the general name of Burnt Islands. As an examination failed to discover a channel through them fit for anything larger than a small fishing tug—and even she would require local knowledge—only the outside islands of the group will be described.

Hog Island is situated nearly midway and in a line between the southern point of Big Burnt and Fishing Islands. A large bank of dry stones extends 440 yards from the southwest side, while from the south point shoal water extends 590 yards.

Gooseberry Island, small, with a few trees on it, is situated nearly 880 yards eastward from the south point of Hog Island; shoal water extending 200 yards southeastward from it.

Big Burnt Island, the largest and easternmost of the whole group, is $1\frac{1}{4}$ miles long and 880 yards in greatest breadth. An island 150 yards in diameter lies 300 yards from the south shore, being connected therewith by a shallow bar. From the latter island a reef extends 440 yards southward and 300 yards eastward. The east and northeast sides of Big Burnt Island are steep-to.

Directions for Smith Bay.—If from the south, follow round Cape Smith at about 440 yards, and when abreast of the northwest point of the cape, if intending to pass south of Goldhunter Rock, bring the middle of the village of Wekwemikong about a point on the starboard bow until the two points of Cape Smith come in range, bearing 102° (ESE. $\frac{3}{4}$ E.). This range should be on astern before the west end of Bushy Clump and east end of West Red Cliff are touching, but not before East Red Cliff bears 174° (S.). Keep the two points of the cape in range until the summit of Badgeley Island is in range with the east side of Big Burnt Island, bearing 10° (N. by E. $\frac{1}{4}$ E.) when Goldhunter Rock and the outer part of Red Cliff Flat will be passed.

A vessel may anchor off West Red Cliff on the last mentioned clearing mark or proceed further up the bay. Not more than 10 fathoms over mud will be found anywhere inside the line joining Cape Smith and William Island.

If entering the bay northward of Goldhunter Rock, The Spur should not be brought westward of the middle of the high portion of William Island until the summit of Badgeley Island is over the east side of Big Burnt Island, when a vessel may haul toward the cape shore and anchor, or proceed up the bay. In doing the latter she will probably pass close to Doyle Rock, the least water on which is 22 feet (in low stages there may be 4 feet less).

From North Channel of Lake Huron.—When southward of Burnt Island Bank (later described), the east shore of Big Burnt Island may be approached within 200 yards. After passing it, keep the summit of Badgeley Island well open east of Big Burnt Island, the latter bearing 356° (N. $\frac{1}{4}$ E.), to lead eastward of Pelkie Rock,

and when East Mound comes in range with The Spur, bearing 315° (NW. $\frac{1}{2}$ N.) steer up the middle of the bay, or, if wishing to anchor under Cape Smith, edge a little westward to bring the summit of Badgeley Island in range or closed with the east side of Big Burnt Island, in order to lead westward of Goldhunter Rock.

If wishing to anchor under the northwest side of William Island, keep the top of Badgeley Island well open east of Big Burnt Island to clear the bank southward of the latter, until West Mound bears 230° (SW. by W. $\frac{1}{2}$ W.) in range with the high bank on the northern shore of the bay. Proceed on this leading mark, and anchor northward of the southwest grassy point of William Island, in 4 and $4\frac{1}{2}$ fathoms clay, or if wishing to proceed to the bottom of Smith Bay, after passing the point of the island just mentioned, keep the top of Badgeley Island in range with the same point bearing 21° (NNE. $\frac{1}{2}$ E.) which will lead between West Mound and Frank Ledge.

A vessel from the southeast may proceed to the anchorage under the northwest side of William Island if her compass is in good order, by steering for West Mound on a 286° (WNW.) course, which will lead between William Island Bank and Frank Ledge with $3\frac{1}{2}$ fathoms.

Bernard Rock with 10 feet water on it (at low stages there may be 4 feet less) lies 54° (NE. by E. $\frac{1}{2}$ E.) a little more than $2\frac{1}{2}$ miles from the northeast and nearest point of Big Burnt Island, and in case the buoy should be displaced, its position in one direction may be known, from the fact of its lying with William Island its own apparent breadth, open southeast of Big Burnt Island. To pass northwest of it, therefore, keep these islands touching and bearing 222° (SW. $\frac{1}{2}$ W.).

Additional clearing marks.—Summit of Heywood Island in range with the south side of Partridge Island bearing 273° (W. $\frac{1}{2}$ N.) leads 1,320 yards north of it. The summit of Badgeley Island over the southwest end of Kokanongwi Island bearing 348° (N. $\frac{1}{2}$ W.) leads 880 yards west of it, and the same hill in range with the opposite end of Kokanongwi Island, bearing 327° (NNW. $\frac{1}{2}$ W.) leads 1,320 yards northeast of this danger. The south fall of Sheguindah Hill in range with Bold Point, Manitoulin Island, bearing 271° (W. $\frac{1}{2}$ N.), leads 200 yards south of Bernard Rock.

At night, give it a good berth by a bearing of High Beach powerful back light.

Buoy.—Bernard Rock is marked by a red and black horizontally striped spar buoy.

Northwest Burnt Island is situated nearly 880 yards northwestward from Big Burnt Island, and hence its name. It is smaller than the latter, being a little less than 1 mile long north and south by 880 yards in breadth. It is surrounded on all sides by shoal water,

except the northwest side where the shoal extends only 200 yards and the east point which the deep water reaches to within 100 yards.

Burnt Island Bank is a dangerous shoal extending northward and eastward from Northwest Burnt Island; the total length of the shoal in an east and west direction, being nearly $1\frac{1}{4}$ miles. The western part is the shoalest, there being only 1 foot of water on it, and in consequence generally showing itself by breaking, but the eastern part with 6 feet on it is the most dangerous, for being the turning point into North Channel of Lake Huron it is more likely to pick a vessel up.

Clearing marks.—To pass eastward of this bank, keep Lions Head Hills in range with the east end of High Beach bearing 353° (N. $\frac{1}{2}$ W.) and to pass northward of it no better mark offers than to bring Eads Bush (Little Current) northward of the summit of Heywood Island, the two in line bearing 280° (WNW. $\frac{1}{2}$ W.).

Skull Point is the English equivalent for an Indian name given to a point of Manitoulin Island 1 mile west by north from the north part of Northwest Burnt Island. Skull Point is situated also 1 mile northward from Prairie Point and the shore between them is foul.

Skull Point Reef extends from the point in a direction a little eastward of north, 880 yards, the least water on it being 3 feet. Between this reef and Burnt Island Bank there is a deep water space of 1,175 yards.

Clearing marks.—Indian Dock Point just in sight, 241° (WSW.), leads northwestward of this reef, and the middle of Kokanongwi Island in range with the south point of Badgeley Island, bearing 69° (ENE. $\frac{1}{2}$ E.), also leads clear on the same side.

Bold Point, so called from the fact of there being deep water close to it, is 1,320 yards northwestward of Skull Point, being the most northerly point of this peninsula. Between them a bight runs in 440 yards, in the middle of which are dry stones and sunken rocks. From Bold Point the shore turns to the southwest, and runs in that direction over 1,320 yards to Indian Dock Point. Between these points is situated the cove which contains the wreck of a once fine wharf or dock, from which the turning point into Manitowaning Bay derives its name.

Squaw Island is situated with its southern extremity $5\frac{1}{4}$ miles 81° (E. $\frac{3}{4}$ N.) from the northeastern extremity of Cape Smith. This island itself is low, but its thick and fairly high timber enables it to be seen at a considerable distance, and it is one of the most important fishing stations in Georgian Bay. The island has a total length of $1\frac{1}{2}$ miles and maximum breadth of 880 yards.

Young Squaw is the name given to the wooded islet 880 yards northeastward from North Point of Squaw Island, and to which it is connected by a rocky bar with 6 feet water on it. Young Squaw

may be approached to 100 yards from the eastward only; in all other directions the water is shallow.

Annie Rock, with 3 feet on it, lies 880 yards northwest from Young Squaw, while shoal water extends from the latter the same distance in the opposite direction.

West Rock is a small bank of limestone gravel 5 feet high, situated nearly $1\frac{1}{2}$ miles west-southwest from North Point of Squaw Island, and is separated from the latter island by a narrow channel from 4 to 5 fathoms deep, but which should not be attempted by strangers.

North Spit extends 880 yards northward from West Rock, at which distance there is a depth of 13 feet. West Rock should not be approached from the west nearer than 590 yards, while 880 yards from West Rock is the southern termination of a bank with a depth of 3 fathoms, rapidly shoaling as West Rock is approached.

Ragged Point is situated about the middle of the west side of Squaw Island, the whole of which is fringed with boulders and shoal water for 440 yards, while off this particular point a bank extends west-southwest 880 yards with depths under 3 fathoms.

South Point of Squaw Island, as the name indicates, is the southerly termination of the island, and from it shallow water extends in a southerly direction 590 yards. Between the last two mentioned points is an open bight full of boulders. The east side of Squaw Island, from the southeastern entrance point of the harbor to 440 yards north of South Point has a steeper character and may be approached to 300 yards.

The Bar is the name given to the shallow rocky bank immediately eastward of the entrance of the harbor, and has depths on it ranging from 6 to 12 feet.

Clearing marks.—To pass northeast of it, Lion's Head Hill should be kept open north of Young Squaw, the latter bearing 316° (NW. $\frac{1}{2}$ N.). To lead southeast of it keep any part of Claycliff (Cape Smith Shore), open southeast of Squaw Island, bearing about 230° (SW. by W.).

Squaw Island Harbor is formed on the northeast side of Squaw Island, and consequently contains good shelter from the prevalent southwesterly as indeed from all winds. It is the principal fishing station in Georgian Bay, being conveniently situated to the fishing grounds on Grand Bank between Lonely and Gull Islands. The depth in the harbor itself ranges from 12 to 15 feet over mud, and were the entrance buoyed, as was temporarily done for the steamer *Bayfield* during the survey of that portion of the bay in 1885, 13 feet of water could be carried in, although in very low stages there may be 4 feet less. Without the assistance of buoys no vessel draw-

ing more than 8 feet should attempt to enter; larger vessels should anchor 440 yards east-southeast from the southeast entrance point; smaller vessels may enter by the following:

Directions.—If from the southeast, bring Lion's Head Hill in range with North Point (Squaw Island) bearing 318° (NW. $\frac{3}{4}$ N.) and proceed to the southeast entrance point on this mark; round the latter closely and anchor in the middle of the harbor as convenient, or proceed to the wharf. If from the northwest give the ground about Annie Rock a good berth; after passing Young Squaw keep Lion's Head Hill open northeast of it, the latter bearing 316° (NW. $\frac{3}{4}$ N.) until Claycliff is seen open of South Point of Squaw Island; steer on this mark until the low southeast entrance point of harbor bears 289° (NW. by W. $\frac{3}{4}$ W.) when the latter point may be steered for. Those locally acquainted approach the harbor from the northeast and cross the Bar with the southeast entrance point in range with the willows in Killarney's Cove (a small indentation on the west side of the harbor) carrying not less than 10 feet.

Alec Clark Rock, under the depth of 3 fathoms, is a narrow bank 880 yards long in a north-northwest direction, its shallowest part with depth of 13 feet lying 1,320 yards northeast from Young Squaw with a depth of 4 to 6 fathoms between them.

Matheson Shoal, with $3\frac{1}{2}$ fathoms on it, lies $2\frac{1}{4}$ miles eastward from Young Squaw.

Azov Ledges are two dangerous banks, with 9 feet and 6 feet on them, lying west-southwest 2 miles and $1\frac{1}{2}$ miles, respectively, from South Point, Squaw Island. These ledges are separated from Squaw Island by a channel over 1,320 yards wide, with 5 to 7 fathoms water. The steamer *Bayfield* has run through this channel by keeping Frazer Bay Hill (a conspicuous hill on the north side of Frazer Bay) in range with the northeast point of Kokanongwi Island, bearing 333° (NNW.), but the latter being difficult of discernment the range can not be recommended to strangers.

Clearing marks.—The northwest side of Green Island touching the extremity of Squaw Island bearing 46° (NE. $\frac{3}{4}$ E.), leads 200 yards southeast of Azov Ledges. The northern extremity of Cape Smith range with the southwest end of Wekwemikong clay bank bearing 283° (WNW. $\frac{3}{4}$ W.), leads over 1,320 yards south of Azov Ledges.

In thick weather do not shoal to less than 10 fathoms round Squaw Island and its shoals.

Papoose Island 10 feet high, lies 5 miles 75° (E. $\frac{3}{4}$ N.) of North Point, Squaw Island, and also $4\frac{3}{4}$ miles 79° (E. $\frac{1}{2}$ N.) from Young Squaw. The island is 590 yards long east and west, quite narrow, and divided into two portions by a boat channel in which fishing

boats occasionally rendezvous. A few huts are erected on the western and larger portion, and a small wharf to facilitate the landing of crews during the fishing season. The east, north, and northwest sides of Papoose Island may be approached to 200 yards, but from the south side a dangerous rocky ledge extends 880 yards.

Clearing mark.—To pass southwestward of this reef keep Broad Hill in range with Killarney East Lighthouse, bearing 323° (NNW. $\frac{1}{4}$ W.).

Gull Island lies $17\frac{1}{4}$ miles 101° (ESE. $\frac{1}{2}$ E.) from the northwestern extremity of Burnt Island Bank at the eastern entrance of North Channel of Lake Huron. It is 10 feet high and composed of fossilized limestone, is 350 yards long northeast and southwest and 100 yards broad, the southwestern portion having on it a few stunted trees and bushes. Shoal water extends 200 yards from the southeast side and 250 yards from the southwest extremity, being otherwise bold to.

Seven Fathom Bank.—Under the depth of 10 fathoms this bank is $1\frac{1}{4}$ miles in diameter, its shoalest and northern edge with depth of 6 fathoms lying $4\frac{1}{2}$ miles 106° (ESE. $\frac{1}{4}$ E.) from the northeastern extremity of Gull Island. The course from North Channel of Lake Huron to the fairway buoy of Byng Inlet leads over this part of Seven Fathom Bank, a cast on which in thick weather may afford a check on a vessel's position.

Pat Howe Patch, with 48 feet on it, lies $2\frac{1}{2}$ miles 145° (SSE. $\frac{3}{4}$ E.) from South Point, Squaw Island.

Watson Patch, with 54 feet least depth, lies $6\frac{1}{4}$ miles 165° (S. $\frac{1}{4}$ E.) from South Point, Squaw Island.

Northeast Shingle is a narrow bank, the shoalest part of which, 880 yards long in a north-northeast direction, is composed of boulders on which there was in 1885 from 2 to 5 feet water. This northern portion lies $4\frac{1}{2}$ miles 46° (NE. $\frac{3}{4}$ E.) from Lonely Island Lighthouse. These boulders must have been a few feet above the water in 1822, as they were in that year observed on it for variation of the compass. In July, 1914, the two patches indicated by crosses on the chart were out of water, the northeastern and larger patch to the extent of 3 to 4 feet.

In addition to this very shallow part, dangerously shoal water extends from it in northeasterly and south-southwesterly directions 880 yards and $1\frac{1}{4}$ miles, respectively, making the total length of the shoal $1\frac{1}{2}$ miles. The southern extremity with a depth of 12 feet in 1885 lies about 3.6 miles 49° (NE. by E.) from Lonely Island Lighthouse.

Northeast Shingle is connected with Lonely Island by a bank with depths on it varying from 6 to 8 fathoms. The summit of Fitzwill-

iam Island in range with the northwestern extremity of Lonely Island 252° (W. by S.) leads 1 mile southward of Northeast Shingle. The southeast visible extremity of Fitzwilliam Island, touching the northwestern point of Lonely Island, bearing 241° (WSW.) leads 440 yards southeast of it, with 5 fathoms. The northwest side of Fitzwilliam Island in range with the same side of Club Island 244° (WSW. $\frac{1}{2}$ W.) leads northwestward of this shoal.

Buoy.—A red spar buoy marks the southwestern extremity of Northeast Shingle.

In thick weather a vessel should not approach the southeast and west sides of Northeast Shingle to a less depth than 20 fathoms. On the north and east sides it may shoal to 10 fathoms.

Grand Bank is an extensive plateau with a mixed character of bottom having less than 20 fathoms of water upon it, spreading out from Lonely Island in a general northeasterly direction to the north shore of Georgian Bay.

Dawson Rock.—Although not quite so shallow as the last mentioned danger, there being 4 feet water upon the rock (1884), yet from its greater distance from the nearest island, and lying nearly in the direct course from the southeastern ports of Georgian Bay to North Channel, as well as being in the track from Tobermory to French River, it becomes one of the most formidable dangers in the navigation of the bay.

The whole patch of bowlders and rock under the depth of 21 feet is pear-shaped, with the stalk to the north, and is over 1 mile in length and nearly 1 mile broad. The shoalest water is on the eastern side of the patch, varying from 4 feet (in 1884) on the southern part, to 10 feet on the northern extremity. The latter lies 11 miles 68° (ENE. $\frac{1}{2}$ E.) from Lonely Island Lighthouse. The southern extremity of the shoal is $\frac{1}{2}$ mile nearer Lonely Island.

The north end also lies $16\frac{1}{2}$ miles 147° (SSE. $\frac{1}{2}$ E.) from Young Squaw Island.

The soundings give very little indication of the approach to the east side of Dawson Rock, there being 18 fathoms $1\frac{1}{2}$ miles, and nearly the same water 440 yards from the depth of 9 feet. On the southeastern side, 20 fathoms will be found 1,320 yards from the rock; on the southwest, 10 fathoms at $1\frac{1}{2}$ miles; while northwest of the rock the latter depth will be found at 590 yards.

Buoy.—A black spar buoy is moored near the northern end of Dawson Rock.

North and northwestward of Dawson Rock, there are five rocky patches with $4\frac{1}{2}$ to $5\frac{1}{2}$ fathoms over them, which in a heavy southeast sea it might be well to avoid, more particularly as fishermen have reported since the survey was made as little as 18 feet in this locality; possibly on Riley Patch.

Tranch Rock, the southwesternmost of these patches, has $4\frac{1}{2}$ fathoms on it and lies $3\frac{1}{4}$ miles west-northwest from the north end of Dawson Rock.

Ben Back Shoal, with $4\frac{1}{2}$ fathoms, lies north-northwest $3\frac{1}{4}$ miles from Dawson Rock.

Riley Patch, with the same depth on it, lies on the same bearing, $4\frac{1}{2}$ miles from the north end of Dawson Rock.

Milligan Rock, with $5\frac{1}{2}$ fathoms, is situated north by west, $2\frac{1}{2}$ miles from Dawson Rock.

McNeil Ledge, with 5 fathoms over it, lies nearly 5 miles 8° (N. by E. $\frac{1}{4}$ E.) from the northern extremity of Dawson Rock.

Georgian Bay entrance to North Channel.—This entrance, between Bold Point, Manitoulin Island, and George Island, is about 7 miles wide and partially filled with islands and shoals. The passage for vessels, except those of light draft and possessing local knowledge, lies between Bold Point and the southern end of Badgeley Island.

Kokanongwi Island, the Indian name of a small fish, is 1,175 yards long northeast and southwest, and nearly 440 yards broad. It lies a little over 1,320 yards southeastward from the middle of the southeast side of Badgeley Island. Shoal water extends 300 yards south and west, from its southwest point, leaving its northwest and north sides steep-to. A large rocky flat extends from the southeast side 880 yards, almost joining the shoal water from Kokanongwi Shingle.

Kokanongwi Shingle.—This is a bank of stones 5 feet above the water (in 1885), situated 1,175 yards east-southeast from the north point of the island of that name. A shallow spit extends from it in a northeast direction 200 yards, and a bank runs from it southwest by south 440 yards, leaving a channel 200 yards wide between it and the bank from Kokanongwi Island. The summit of Cape Smith in range with Kokanongwi Shingle, bearing 190° (S. by W. $\frac{3}{4}$ W.) makes a good lead toward the western entrance to Killarney Harbor.

Linter Rock, with 14 feet least water on it, lies southward 1,175 yards from the southern Twin Island, and north-northeast a little more than that distance from the north part of Kokanongwi Island. Killarney West Lighthouse and Leading Mark Hill in range bearing 36° (NE. $\frac{1}{4}$ N.), lead northwestward of this rock also.

George Island is shaped like an equilateral triangle, the length of each of the sides being about $1\frac{1}{4}$ miles, the northeast side forming the southwest shore of Killarney Harbor. The southeast coast of George Island from Northeast Point is bold-to.

Petley Rock, with 1 foot of water on it, lies 150 yards from the southern extremity of George Island, and shoal water continues from

it 100 yards in a west-southwest direction. The shore here should receive a berth of 590 yards.

Sandy Cove is a snug little indentation at the southwest point of George Island; this point is surmounted on its northern side by a round bare hill 60 feet high.

Sandy Cove Ledge, 2 feet high, lies 250 yards from the mouth of the cove whence it derives its name, and from it the water falls off deep westward and southward, but there is no passage between it and the shore. The west side of George Island to Fish Point—its northwest extremity—is ragged and fringed with a rocky bank extending for an average distance of 440 yards from shore.

George Rock, the top of which is just covered, lies a little over 1,320 yards north-northwest from Sandy Cove Ledge, being 590 yards from the nearest part of George Island.

Gull Roost, 11 feet high, is the highest of the granite rocks which skirt this shore, and should not be approached within 200 yards.

Fish Point is the northwestern extremity of George Island, and is composed of two low bare islets 5 feet high, between which and the main island there is a boat passage. It derives its name from being the place where the fishermen of Killarney formerly deposited their fish refuse.

Ann Long Bank.—A depth of 7 feet will be found a little more than 440 yards in a westerly direction from Fish Point, to lead west of which keep Killarney West Lighthouse in range with the very highest part of Leading Mark Hill, bearing 36° (NE. $\frac{1}{4}$ N.).

Note.—The channel past Killarney is to be treated as a through channel upstream from the east entrance.

Buoy.—A black spar buoy marks the northwestern extremity of Ann Long Bank.

Buoys.—Three red spar buoys mark the northern edge of the dredged channel at the western entrance to Killarney Harbor.

Killarney Harbor (Shebaonaning), as its Indian name indicates, is a narrow strait dividing George Island from the main shore, and affords excellent shelter from all winds, the depth in the channel being 17 feet (at low stages there may be 4 feet less). The village itself in 1901 had a population of 207, subsisting mainly by the fishing interest. It contains a hotel and store where small supplies may be obtained. There is frequent steamboat communication with Sault Ste. Marie and the principal ports of Georgia Bay and North Channel of Lake Huron.

The north shore of Killarney Harbor is indented by three coves, the easternmost of which runs in immediately westward of East Lighthouse.

Killarney East Light, fixed white, 54 feet above water, visible 12 miles, is shown from a white, square, wooden structure on Red Rock Point, 1 mile eastward of Killarney.

Fog signal.—The fog signal is made on a hand horn which replies to vessels signals.

Killarney West Light, fixed white, 37 feet above water, visible 11 miles, is shown from a white, square, wooden structure on Partridge Island, 1 mile northwest of Killarney.

Thebo Point separates the cove westward of East Light from Thebo Cove, and this point, although low, is quite steep-to. Flat Point is the name given to the projection dividing Thebo from Cameron Cove, the western one of the three on the northern shore of the harbor.

From Flat Point shoal water extends 50 yards. Cameron Cove has two islets in the western part of the entrance, from the western one of which a shoal extends toward the channel 50 yards.

Le Hayes Point applies to the southwest extremity of the mainland and forms the north point of the entrance from the west. This point has a rock 6 feet high lying 40 yards off, together with a small dry stone 100 yards west of it, the channel here being only 70 yards wide. Between Cameron Cove and Le Hayes Point the mainland shore is nearly straight west-northwest and east-southeast, and fringed for nearly 1,320 yards with various wharves at which good water will be found. The south shore of the harbor between Northeast and Fish Points, although straight on the whole, is broken by several small coves.

Bayfield Bluff is a low cliff forming the southeast side of one of these coves situated 880 yards from Northeast Point and nearly opposite the southeastern wharf. This bluff is so called from the circumstance of the surveying steamer *Bayfield* having occasionally made fast to it during the progress of the survey in this locality in 1885, so as not to be disturbed by vessels coming to the wharves on the village side.

Entrance Rocks, 6 feet high, lies 150 yards northward of Northeast Point and are 100 yards in extent northwest and southeast. Not more than 8 feet of water can be carried between them and George Island, but they are steep-to on the north side.

Pancake Rock, just showing above the water in 1885 (2 feet above in 1914), lies 130 yards eastward of Northeast Point, and between them the passage is only fit for a boat.

Jackman Rock, a small lump with 8 feet water over it, is situated 200 yards eastward from Entrance Rocks. Fish Point closed with the wharves on the north shore, the latter bearing 283° NW. $\frac{1}{2}$ W.) leads northward of this obstruction.

Directions—From eastward.—Approaching Killarney Harbor from the southeast, bring East Lighthouse under the highest part of Leading Mark Hill, bearing 359° (N. $\frac{3}{4}$ E.)—at night, the light on this bearing—and proceed for it, thus to avoid Jackman Rock, until Fish Point is well closed with the wharves at the village, the latter bearing 283° (WNW. $\frac{3}{4}$ W.), which mark will lead northward of the same. After passing Entrance Rocks, which can generally be made out on a dark night, keep the George Island shore on board to avoid a shallow stone (above water in 1914) lying 50 yards off a point on the north side of the harbor immediately opposite to Bayfield Bluff. A depth of 4 fathoms may be carried in by this entrance.

From westward.—Proceeding to Killarney from North Channel of Lake Huron, the most direct track is between Kokanongwi and Badgeley Islands; and West Lighthouse should be steered for in range with the highest part of Leading Mark Hill on a 36° (NE. $\frac{3}{4}$ N.) bearing, to lead southeast of Double Island Ledges and northward of Linter Rock and Ann Long Bank. By day the vessel's head may be turned more eastward when Badgeley Rocks (described later) come in range with Lion's Rump about 260° (W. $\frac{3}{4}$ S.). Run on the latter mark astern until the northeast part of George Island is touching or slightly closed with Le Hayes Point, bearing 109° (SE. by E. $\frac{3}{4}$ E.). The most water that a vessel in 1885 could carry into Killarney by the northwestern entrance was 17 feet (at low stages there may be 4 feet less).

At night.—On the darkest night the black outline of Leading Mark Hill is discernible with the aid of a glass, and the hill and West Lighthouse should be kept in range as previously directed until East Lighthouse has passed across northward of Le Hayes Point, when a vessel may haul up for the entrance. A vessel should not haul up too soon, remembering that she would have to be within 200 yards of Double Island before she could get ashore, and moreover a sheer to starboard would soon put her into deeper water. A stranger should not attempt either of the entrances to Killarney by night until he has had some experience by day.

Pond Point (so called from a lake immediately at the back of it) is the first decided point northeastward of Killarney East Lighthouse, being $1\frac{1}{4}$ miles therefrom. Between this point and Western Entrance to Collins Inlet the shore is much broken up with a number of small bays and islands, which offer good shelter for small boats, but being very foul should not be approached by a vessel nearer than the line joining Pond Point to One Tree Island.

Rannie Rocks, 2 feet high, lie 440 yards northeast by east from Pond Point and are steep-to. One-third of a mile southwestward of Pond Point is the entrance to an excellent little boat harbor. Be-

tween this cove and Killarney East Lighthouse the shore is fairly straight, with a few small rocks lying close to it.

Collins Inlet.—Collins Inlet is the water separating Philip Edward Island from the mainland, the island being about 12 miles long and 3 miles in greatest breadth. The Collins Inlet Lumber Co.'s mill is situated about 9 miles from either entrance, and with local knowledge or assistance light-draft vessels can reach it from either entrance, though the western entrance is the deeper and that generally used. The distance between the two entrances in an air line is about 10 miles. In 1885 the surveying steamer *Bayfield* carried in 14 feet to the anchorage northeast of Goat Island by Eastern Entrance (in low stages there may be 4 feet less); and in that year it was reported that 9 feet water could be taken thence to the mill. In 1914 very little business was done at the mill, and no vessels used Eastern Entrance.

Western Entrance.—Vessels of light draft can proceed to the mill situated about 9 miles from Western Entrance. The latter is situated $4\frac{1}{2}$ miles east-northeast from the east entrance to Killarney, where a stranger bound to the inlet should engage a pilot. After being assisted in and out once the master of a vessel should be able to reach the anchorage under South Point.

One Tree Island.—This island, 21 feet high, possessing in 1885 a conspicuous tree, hence its name (but which in 1914 was nonexistent), is situated 3.3 miles 74° (E. by N.) from Killarney East Lighthouse and 1,320 yards from South Point, the southeast entrance point of the inlet. A ledge with less than 6 feet water on it extends 250 yards west-northwest from One Tree Island, and a small rock 3 feet high lies 300 yards eastward from it. Between this small dry rock and South Point are several shoal spots with deep water between them, rendering the passage between One Tree Island and South Point impracticable for a stranger.

Beacon.—On the summit of One Tree Island is erected a white beacon.

A rock, with 1 foot water on it, lies 440 yards north-northeast from One Tree Island and north of the channel; two other rocks, with 6 feet and 5 feet water on them, lie northeast by north 300 yards and 440 yards east-northeast, respectively, from the island.

Flat Rock is a reef 10 feet above the water lying 300 yards west-northwest from One Tree Island, and between them is the narrow channel through which from 5 to 6 fathoms may be carried. Flat Rock is divided into three parts, its total length being 350 yards; a single black stone 2 feet high lies 100 yards westward from it. Deep water will be found close to the south side of Flat Rock, with the exception of near the eastern extremity, where a shallow spur puts out into the channel about 50 yards.

Beacon.—In 1914 a small and roughly built beacon, erected by the mill people, stood upon the central part of Flat Rock.

Pinch Island, about 15 feet high, is situated 200 yards northeastward of Flat Rock, and between them there is no passage. A chain of islets and rocks connects this island with the north shore.

South Point is the western termination of the broken portion of Philip Edward Island, 1,175 yards east by north from One Tree Island. It forms the southeast entrance point of the inlet, which is here 590 yards wide with a depth of 8 fathoms over mud. The northwestern extremity of a reef with 3 feet water on it lies westward 440 yards from South Point, and a rock with 9 feet water on it lies on the north side of the passage 440 yards northwest from the Point.

Mocking Bird Island, 23 feet in height and somewhat resembling One Tree Island in appearance, is situated 1,175 yards southeast from the latter. From the northern extremity a reef extends in a northwesterly direction 440 yards; the east and west sides of this treeless island are steep-to.

Celtic Rocks are situated southwestward 200 yards from Mocking Bird Island, and between them there is no passage. The southern rock of the two is 4 feet high, and from Red Rock lies north-northeast nearly a mile. The east and west sides of Celtic Rocks are steep-to, but 200 yards south-southwest from the southernmost one there is a rock with 7 feet water on it.

Halkett Rock, with 5 feet over it, lies a little more than 1,320 yards east-northeast from Red Rock. To pass southwestward of all the dangers, a vessel should not proceed further eastward than to bring Red Rock in range with the second and lower gap westward of Leading Mark Hill, bearing 316° (N. W. $\frac{1}{2}$ N.), which range leads but 200 yards southwestward of Alexander Rock.

Red Rock is a small bare islet of that color situated about $3\frac{1}{4}$ miles, 104° (ESE. $\frac{1}{4}$ E.), from Killarney East Lighthouse; it is 11 feet in height, and by its isolation is conspicuous. It is also a good guide for Western Entrance to Collins Inlet. Two rocks, with 10 feet and 13 feet on them, lie, respectively, 150 and 250 yards north-westward from Red Rock and are otherwise bold to.

Alexander Rock, with 9 feet on it, lies 1.1 miles southeast from Red Rock.

The Brothers are two small rocks 5 feet in height situated 1,320 yards west-northwestward from West Fox Island and 2 miles east by south from Red Rock.

Harty Patches are two small rocks, with 6 feet and 13 feet on them, lying 880 yards westward of the Brothers, the northeast and shoaler one being 1.6 miles east by south from Red Rock.

West Fox Island is the most westerly of a group of islands situated 2 miles northwestward of Hawk Islands. It is from 70 to 80 feet in height, fairly wooded, and 440 yards long north and south; dry rocks lie 440 yards from it, south and southwest sides. West Fox Island lies 3 miles northwest by north from Green Island.

Nicholson Rock, with 5 feet water upon it, lies 880 yards southwestward from this island and 1,175 yards northeastward of The Triangle.

The Triangle is the three sunken rocks with 4, 7, and 8 feet water over them. The southwestern rock of the three, with 7 feet water on it, lies with the east end of Papoose Island bearing 163° (S. by E.) open westward of Scarecrow Island, the breadth of the latter distant $1\frac{1}{4}$ miles.

Le Haye Rock, small and just showing above the surface, lies $1\frac{1}{4}$ miles northwest from Green Island; the water is bold close up to its south and west sides.

Directions—Collins Inlet Western Entrance.—If from the southeast, steer from Scarecrow Island until Red Rock comes in the second gap westward of Leading Mark Hill, bearing 317° (NW. $\frac{3}{4}$ N.); this will lead between Single Rock and the northeastern part of Scarecrow Island Bank. If this leading mark is not easily distinguishable, proceed farther west, keeping 1 mile southward of Scarecrow Island until Red Rock is in range with Killarney Peak (a sharp wooded mound at the back of Killarney) bearing 332° (NNW.). Either leading mark kept on will lead southwestward of all dangers between Green Island and Red Rock; the last-mentioned mark will, of course, give them the wider berth.

Pass 200 yards or more westward of Red Rock and steer about $1\frac{1}{4}$ points westward of One Tree Island to bring the west end of Flat Rock in range with the eastern summit of a double-topped eminence on the back range 955 feet in height, known as Gulch Hill, bearing 2° (N. $\frac{3}{4}$ E.); this mark will lead west of the reef from One Tree Island. Keep the southeast side of Flat Rock on board, giving the east end of it a little berth to clear the sunken rocky spur already alluded to—in ordinary weather the yellow water will show distinctly—and steer for the mouth of the inlet with the southeast side of Flat Rock exactly under the highest part of Badgeley Island astern, bearing 255° (W. $\frac{1}{4}$ S.); which will lead between the 1-foot and 6-foot rocks (they are only 150 yards apart), and anchor north of South Point until assistance is obtained to proceed to the mill.

Eastern Entrance—Dangers.—**Moreland Bank**, with 3 fathoms water on it, is the outer shoal in the approach to Eastern Entrance, lying $2\frac{1}{4}$ miles southwest of Toad Island and 1,320 yards southeast of the leading mark.

McDonald Shoal, with $3\frac{1}{2}$ fathoms, lies southwest by west $1\frac{1}{2}$ miles from the same and 590 yards on the same side of the leading mark.

Toad Island, nearly 1 mile northwestward from Popham Point and 590 yards in diameter, is, together with the smaller one close southeast of it, conspicuous from the offing, and therefore serve to point out Eastern Entrance. A small bushy islet is just separated from the northeastern extremity of Toad Island, and 200 yards from this bushy islet, in a northeast direction, lies a rock with 7 feet water on it, which should be carefully avoided when anchoring under the north side of Toad Island. A reef of dry and sunken rocks extends 1,320 yards southwest from Toad Island.

North and South Rocks about 5 feet high, both bare and of similar appearance, are situated one on each side of the channel north of Toad Island, and here will be found the shallowest part with depth in 1885 of 14 feet; northeast of these two rocks, the water deepens suddenly to 8 fathoms.

Square Rock—Pine Tree Island.—The former, small, isolated and 4 feet high, lies $1\frac{1}{2}$ miles northeast of Toad Island, and 250 yards northwestward of Pine Tree Island, small and wooden with two conspicuous pines near its west end, which assist in picking up Square Rock from outside.

Midshipman Point, the southeastern extremity of Philip Edward Island, and 1,320 yards northeast of Toad Island, marks the limit of the survey in 1885.

Anchorage.—Southeast of the above point, a vessel for the mills waiting for a local pilot will find good anchorage in 8 to 10 fathoms over mud.

Hincks Island, 440 yards in diameter, lies rather over that distance northwest from Toad Island, the channel being between them.

Brassey Island, 19 feet high, and small, is by reason of its bareness, a conspicuous object in making Eastern Entrance; it lies 1.1 miles westward from Toad Island, and there are boat channels between it and the chain of islets connecting it with the shore. A rock with less than 6 feet on it lies 150 yards from its southwestern extremity.

Sly Boots, a rock with 3 feet water over it, lies 1,175 yards southwest; one with 14 feet, 590 yards east-southeast; and a third with 12 feet, 1,320, south-southeast, respectively, from Brassey Island.

Hamilton Island, 57 feet high and situated $2\frac{1}{2}$ miles westward from Toad Island, is one of the most conspicuous features in this vicinity; and northwest of the line joining Hamilton Island to Smooth Rock, distant $3\frac{1}{2}$ miles west-southwest, the survey was not taken. Hamilton Island is 440 yards long east and west, by half that breadth, and dry rocks extend 300 yards from its southwest point and from the outer of these dry rocks a reef with 9 feet water on it extends

590 yards in a west-southwest direction. From the same outer dry rock a shoal with depth of 12 feet lies south-southwest 440 yards.

Smooth Rock is the southernmost of the rocks of Laurentian formation, and derives its name from its almost polished surface; it is 18 feet high, and lies 440 yards northward from the north gravelly point of Green Island. A rock with 4 feet water on it lies 440 yards northeastward from Smooth Rock; otherwise the water is deep close to the rock on all sides.

The passage is good between Green Island and Smooth Rock, but no stranger should attempt to pass through any of the channels between the islands north of Smooth Rock, as they were not surveyed. The present traffic along this part of the shore is not great, and it is doubtful whether the best chart and sailing directions would take a vessel through this group of islands and sunken rocks without local knowledge. Besides, the passage northward of Smooth Rock saves very little distance in traversing this part of Georgian Bay.

Southwest Hawk Island is an island 38 feet high situated nearly 1 mile northwestward from Green Island. It is the southwesternmost of the group of islands north of Green Island, and which some of the fishermen call Hawk Islands. Southwest Hawk Island has a few trees on its summit, and is steep-to on its west and southwest sides.

Green Island, so called on account of its trees in marked contrast to the adjacent bare rocks and islands of Laurentian formation, is composed of limestone, 10 to 15 feet high, and 590 yards in diameter, and is situated 9 miles 114° (SE. by E. $\frac{3}{4}$ E.) from the southeast entrance of Killarney Harbor and may be said to mark the northern limit of the deeper water in this locality. It is about $3\frac{1}{2}$ miles from the coast of Philip Edward Island, and nearly $6\frac{1}{2}$ miles (in an air line) from Western Entrance of Collins Inlet. Shoal water extends 300 to 400 yards from the southwest and west sides of the island; the remainder of the island may be approached to 200 yards.

A shoal with less than 6 feet over it lies about 660 yards 306° (NW. $\frac{1}{4}$ W.) from the northern tangent of Green Island.

Steel Rock with 11 feet of water on it, is a small spot situated westward 1,320 yards from the west point of Green Island, and between them is a depth of 10 to 11 fathoms.

Single Rock, as its name indicates, is a solitary stone 4 feet high, lying 1,320 yards eastward from Scarecrow Island, and it may be approached on all sides to 50 yards.

Scarecrow Island fairly wooded in 1885 and 6 feet high, lying 2 miles west from Green Island, and 7 miles 125° (SE. $\frac{3}{4}$ E.) from Killarney East Lighthouse, is 200 yards in greatest length, and composed of limestone gravel. In 1914, the taller trees had been burnt

off this island. Its north side may be approached to 150 yards, but on its other side shoal water stretches off under the name of—

Scarecrow Island Bank.—This rocky bank extends from the island 440 yards in a southeast direction, and southwestward 880 yards.

Clearing marks.—Red Rock in line with Killarney Peak, bearing 332° (NNW.) leads southwest; Red Rock in line with the second and lower gap westward of Leading Mark Hill, bearing 316° (NW. $\frac{1}{2}$ N.) leads northeast of the bank.

Directions for Eastern Entrance.—From North Channel of Lake Huron, a vessel may pass northward of Scarecrow Island and between Green Island and Smooth Rock, taking care to avoid the shoal northwestward of Green Island; then, Scarecrow Island kept astern open south of Smooth Rock the breadth of the latter, bearing 256° (W. $\frac{3}{4}$ S.) for 4 miles from Smooth Rock, will lead a vessel to a position a little over 1,320 yards 202° (SSW. $\frac{1}{2}$ W.) from Brassey Island, and to the line of the Eastern Entrance leading mark, viz, Square Rock midway between North Rock and the rocks forming the western extremity of Toad Island, bearing 55° (NE. by E. $\frac{1}{2}$ E.).

This mark should be steered for, the speed reduced, and lead kept going; pass midway between North and South Rocks, and, taking care to avoid the 7-foot rock northeast of Goat Island, a vessel may anchor under its north side, or, in deeper water and with more room southeast from Midshipman Point.

Popham Point—The Chickens.—The point is situated nearly 3 miles west-northwest from Grondine Point, the space between the former and Hen Island being occupied with a group of small dry rocks named The Chickens, extending off 1,320 yards. From the southwestern dry stone, a shallow bank extends 1,320 yards; and, southward as well as southwestward from this bank lie several patches with 3 to $3\frac{1}{2}$ fathoms on them, which in a heavy sea deep draft vessels should keep outside of.

Hen Island, 8 feet high, lies 590 yards offshore and $1\frac{1}{4}$ miles westward from Grondine Point, and from it shallow water extends 1,175 yards in a south-southeast direction.

Draper Island is situated 1,320 yards westward of Grondine Point, and a reef extends from the island southward 440 yards.

Simpson Rock, with 9 feet water, and a shoal with 12 feet, lie southeast 590 yards, and west-northwest 250 yards, respectively, from Grondine Rock.

Grondine (Grumbling) Point is low, flat, and shelving. Shoal water extends 1,320 yards from it in the direction of Grondine Rock, leaving a space of about the same breadth through which small craft occasionally pass by keeping close north of Grondine Rock. Exten-

sive and dangerous shoals lie east and southeast from Grondine Point, the shallowest being Finnis Rock.

Finnis Rock, awash in 1885, is situated 1,175 yards southeast by east from the point, and a rock, with 4 feet water on it, lies 440 yards south-southwest from Finnis Rock.

Grondine Rock, $5\frac{1}{2}$ feet high in 1885 and 50 yards in diameter, is situated 1.1 miles 188° (S. by W. $\frac{1}{4}$ W.) from the Grondine Point; it is also 8.6 miles 94° (E. $\frac{1}{8}$ S.) from the north point of Green Island. Many shoal patches lie near it, but with two exceptions none with less than 15 feet water over them (in low stages there may be 4 feet less) were found.

CHAPTER XV.

STRAITS OF MACKINAC.

The depths given in this chapter are referred to low-water datum, the reference plane for United States river and harbor improvements, which for Lake Michigan is an elevation 579.6 feet above mean sea level. Depths on the Lake Survey charts, referred to standard low water, are 1 foot less than those herein published.

The Straits of Mackinac, on the parallel of $45^{\circ} 50' N.$, between Detour Point and Nine Mile Point of the lower peninsula of Michigan on the east and Waugoshance Lighthouse Tower and Point aux Chenes on the west, are 48 miles long. It embraces the waters commencing at the east point of the Isle Bois Blanc and extends to the south point of Beaver Island. At the eastern and western entrances between the points mentioned the Straits are, respectively, 26 and 13 miles wide, but contracted in the Straits proper to about 6 miles in width between St. Ignace Point on the north and Mackinac Lighthouse on the south. It is here further narrowed by Graham Shoals on the north shore. These shoals are marked by buoys and are not in the direct route of vessels using the south channel. Vessels using the north channel must pass south of the red light and bell buoy on the South Graham Shoal.

The north shore of the Straits is much indented by bays and lined by islands. There are several off-lying shoals, but the water is deep close-to, and they offer no serious obstructions to navigation, being out of the direct track.

The south shore of the Straits is comparatively free from indentations. Shoal water extends some $4\frac{1}{2}$ miles west-northwestward from the extremity of Waugoshance Point, the outer extremity of this shoal being marked by Waugoshance Lighthouse Tower.

The water in the Straits is generally deep, and the shoals lying near the usually traveled routes are usually marked by navigational aids.

The general navigation of the lakes opens with the opening of the Straits of Mackinac, which occurs, on the average, about April 12, though it has opened as early as April 2. The closing date, although largely influenced by the insurance companies, is generally December 15.

Plan.—The plan of this chapter is to begin with Nine Mile Point and to work westward, first describing the southern shore and adjacent dangers and then the northern shore. The general directions for the Straits are given at the end of the chapter.

Nine Mile Point, the southeastern limit of the Straits of Mackinac, is about 7 miles northwest by north from Grace, a village at the northwestern end of Hammond Bay. In the vicinity of this point vessels may approach within 880 yards of the shore.

Cordwood Point.—From Nine Mile Point the shore trends west-northwestward for about 6 miles to Cordwood Point. Nordberg Mill is situated on this stretch, $3\frac{1}{2}$ miles from Nine Mile Point. The shore between them may be approached within 880 yards.

Northeastward of Cordwood Point, within $1\frac{1}{2}$ miles, there are several detached shoals with depths of from 21 to 22 feet, dangerous to large vessels entering the South Channel of the Straits of Mackinac.

South Channel—Coast.—From Cordwood Point the shore trends west-southwestward $2\frac{1}{4}$ miles then changes very abruptly to a north-west by west direction and trends so 2 miles then westward about 880 yards to Cheboygan Lighthouse. A berth of at least 1,320 yards should be given this part of the shore.

McLeod (Duncan) Bay is an indentation just west of the peninsula upon which Cheboygan Lighthouse is situated. It is almost filled with shoals with deep-water channels between them.

In the bay shoals extend about 1 mile off either shore, but a narrow deep-water channel about 440 yards wide leads about midway between them to Duncan.

Cheboygan Light, fixed and flashing white; 54 feet above water, visible 15 miles, is shown from a white square tower on the north side of the point east of McLeod Bay.

Fog signal.—The fog signal is made on a steam whistle.

Cheboygan Shoal, with $14\frac{1}{2}$ feet on it, is nearly 1 mile 50° (NE. $\frac{1}{4}$ E.) of Cheboygan Lighthouse.

Buoy.—A black can buoy is moored on the northern side of the shoal and should be left to southward when passing it.

Cheboygan Harbor includes the reach of the Cheboygan River below a lock and dam about 1 mile from its outlet and an entrance channel a little over 1 mile long in the Straits of Mackinac.

The locality is a lumber producing district and the water traffic is important.

Channel and basin.—The total length of the dredged channel from deep water in the Straits to the State road bridge is 2,635 yards and thence to the lock is 1,270 yards.

An examination made in August, 1919, showed that from the lake to the State road bridge the channel depth was generally more than 18.5 feet, but there were two 100-foot reaches with a minimum depth of 16.2 feet. From the bridge to the lock in the Cheboygan River there was a minimum depth of 6 feet, with a general depth of more than 8.5 feet.

At the river mouth there are slab piers which have been neglected recently because of the closing of the lumber mills.¹ These piers are deteriorating rapidly and the slabs are washing into the channel.

The inner channel is confined between private docks and steamboat wharves. A turning basin was formed in 1895 by widening the dredged channel opposite the angle at McArthur's steamboat landing. This permits the widening of vessels not more than 300 feet long.

The Cheboygan River forms the outlet of Mullet Lake, which is navigable by tugs, launches, and flat scows, but which is separated from the lower harbor by a dam. Communication is afforded by a small lock alongside the dam.

Fluctuations of water surface.—Each year the level of Cheboygan River rises and falls about 3 feet. From day to day the level changes somewhat, due to wind and barometric pressure, such changes sometimes amounting to 1 foot or more, and occasionally a considerable oscillation may take place within one or two hours, amounting to $1\frac{1}{2}$ feet or more.

Light.—A fixed red light, 37 feet above water, visible 10 miles, is shown from a white octagonal tower on a crib, on the west side of the dredged entrance channel to the Cheboygan River.

Fog signal.—The fog signal is made on a bell.

Range Lights—Front Light.—A fixed red light, 45 feet above water, visible 14 miles, is shown from a white, square tower in the city of Cheboygan on the west bank of the river.

Rear Light.—A fixed red light, 75 feet above water, visible about 15 miles, is shown from a black square, pyramidal skeleton tower located 371 yards 213° (SW. $\frac{1}{4}$ S.) from the front light.

These in range lead through the center of the dredged channel from the lake to the mouth of the river.

Bridge.—The State road bridge, about 1 mile above the mouth, is a draw span upon a center pier, with two openings about $46\frac{1}{2}$ feet wide in the clear and clear height of $8\frac{1}{2}$ feet; both openings are available for the passage of small tugs and lighters whenever free from obstruction by log booms and rafts. Signal for opening draw, three blasts (— — —). There are three combination red-an-green lights on top of draw span, showing red when closed and green when open, and three red lights on each end of center pier.

Directions for entering.—To enter the harbor continue on the west course from Poe Reef Light Vessel until the red ranges in Cheboygan are closed, when haul sharp around and steer in on the range, passing the fixed red light on Cheboygan Crib close-to. In approaching from the westward simply look clear of the crib light, leaving it to the starboard while hauling around onto the range.

Storm warnings.—Day and night signals are displayed from a steel tower at the foot of Main Street.

Regulations to govern the floating of loose timber and logs and other methods of navigation on the Cheboygan River, Mich. (See also U. S. Laws.)

In pursuance of authority conferred by an act of Congress approved May 9, 1900, entitled "An act authorizing the Secretary of War to make regulations governing the running of loose logs, steamboats, and rafts on certain rivers and streams," the following regulations are prescribed for the Cheboygan River, a navigable waterway of the United States, whereon the floating of loose timber and logs and sack rafts (so called) of timber and logs, is the principal method of navigation:

REGULATIONS.

1. Steamboats and sailing craft shall have the right to navigate the Cheboygan River at all times.

2. Loose timber and logs shall be formed into rafts on the right or east half of the river, and within the first thousand feet north of the bridge. Such rafts must be at all times guyed with lines at intervals not exceeding 125 feet and of such length as to keep the sides of the boom practically parallel and within 80 feet of each other.

3. All loose logs floated from the upper stream for the purpose of forming rafts shall pass through the east channel of the swing bridge, the west channel being kept clear at all times.

4. Rafts shall be so guyed to the easterly shore of the river that the westerly edge of the raft shall not pass the axis of the river.

5. The trip boom above the bridge for the purpose of guiding logs through the eastern channel shall be kept open at all times, except when free logs are running for the formation of a raft or for some similar purpose. When the trip boom is closed the Cheboygan Boom Co. shall keep a man at said boom so as to open same readily and promptly for all vessels or boats desiring to pass.

6. Vessels shall not at any time lie in the stream for purposes of loading, or for any other purpose, but must, when not in transit to or from the harbor, lie against some wharf or the bank.

Bois Blanc Island, Mich., forming the north side of the South Channel, is wooded and extends $11\frac{1}{2}$ miles west-northwest and east-

southeast, with width of $4\frac{1}{2}$ miles at its southeasterly end and $1\frac{1}{2}$ miles at its northwesterly end. From its southeasterly point rocky shoals extend nearly to Poe Reef.

Poe Reef, a detached shoal extending east and west $1\frac{1}{2}$ miles, with a least depth of 9 feet, lies with its eastern extremity 2 miles southeast of the southeast end of Boise Blanc Island, and nearly due south of the most easterly point of the island.

Poe Reef Light Vessel shows a group flashing white light, 42 feet above water, visible 14 miles. It has a red hull, red mast with a black cylindrical lantern; *Poe* on sides. It is anchored in 30 feet on the east end of Poe Reef, north side of South Channel.

Fog signal.—The fog signal is made on a siren.

Submarine bell.—There is a submarine bell on the light vessel.

Zela Shoal projects from the southwestern side of Bois Blanc Island, from a point about halfway between Point Aux Pius and the northwestern end of the island. It is a narrow spit with a depth of 8 feet at its western end and extends out 2 miles in a northwesterly direction.

Buoy.—A red nun buoy marks the extremity of the shoal.

Caution.—Vessels should not attempt to pass between the buoy and the island.

Lime Kiln Point is the northwestern extremity of the island. Shoal water extends 880 yards northwestward from it to Round Island. From Lime Kiln Point to Point Detachee on the north shore shoal water extends for nearly 1 mile.

Coast.—At 4 miles southeast of Point Detachee a point projects about $1\frac{1}{2}$ miles northward. A shoal with 15 feet on its extremity extends 1,320 yards northwestward from the extremity of this point.

Bois Blanc Light, fixed white, 53 feet above water, visible 14 miles, is shown from a yellow, square tower on a dwelling on the point extending from the north side of the island.

Lafayette Point forms the northeastern extremity of the island. Shoal water extends about 880 yards eastward from it.

Walkers Point is about $1\frac{1}{2}$ miles southwestward of Lafayette Point. Shoal water extends from 440 to 880 yards from the coast between.

Coast guard station.—A coast guard station is located at Walkers Point.

Packard Point.—From Walkers Point the coast trends southwestward nearly 2 miles to Rosie Point, then about $1\frac{1}{2}$ miles more to the westward to Packard Point. Shoal water extends from 440 yards to $1\frac{1}{2}$ miles from this stretch of coast. Three isolated shoals with $18\frac{1}{2}$ feet on them, two with 20 feet on them, and one with $20\frac{1}{2}$ feet on it, all lie within 2 miles of this shore. Another isolated shoal with $18\frac{1}{2}$ feet on it lies about 1,320 yards 214° (SW. $\frac{3}{4}$ S.) from Packard Point.

Main shore, Cheboygan Light to Old Mackinac Point.—Shoal water extends out 880 to 1,320 yards from east of Cheboygan Light through north and west around into McLeod (Duncan) Bay, and a detached 15-foot shoal lies $1\frac{1}{2}$ miles northwest of the light, close to the course for entering Cheboygan Harbor. A bar extends 1,320 yards off the east side of McLeod Bay, leaving a narrow navigable channel leading west-northwest from Duncan Dock to the South Channel. The dock at Duncan is in good condition. With the exception of the shallow offshore water to the northwest and west of Cheboygan Crib Light within a distance of $2\frac{1}{2}$ miles, the coast thence to the Mackinac railroad docks can be approached to within 1,320 yards.

Mackinaw, Mich.—An incorporated village located on Old Mackinac Point, the most northerly point of the lower peninsula of Michigan. It is a station of the Duluth, South Shore & Atlantic, the Grand Rapids & Indiana, and the Michigan Central Railroads. The first-named railroad maintains car ferries to St. Ignace throughout the year to connect with the upper peninsula. The railroad pier is located on the east side of the point about 1,100 yards from the lighthouse and is protected from northwest winds only.

Lights.—A flashing white light, 62 feet above water, visible 16 miles, is shown from a yellow cylindrical tower on old Mackinac Point.

Fog signal.—The fog signal is made on a steam whistle.

A fixed white and fixed red light is shown from the end of the railroad transfer dock (private).

Fog signal.—The fog signal is made on a bell.

Anchorage.—There is anchorage for small-draft vessels 880 yards offshore southeast of the railroad pier.

Storm warnings.—Day and night signals are displayed from a steel tower near the water's edge, about 440 yards north of the railroad pier.

Obstructing Crib.—The old city dock, about 1,200 feet north of the railroad pier, is in ruins and partly submerged. Two or three of the outer cribs are within 3 or 4 feet of the lake surface and should be avoided.

Compass range.—A compass range is located on the beach about $2\frac{1}{2}$ miles southeastward from Mackinac Point Light.

The front mark is a tripod 50 feet high, just back from the water's edge.

The rear mark is a tripod 67 feet high and about 700 yards inshore of the front mark.

The tripods have black and white cage battens with a white cross top mark and a black cross arm above the arm of the white cross.

The range is $224^{\circ} 06'$ true.

Round Island, small and hilly, lies just off the northwestern end of Bois Blanc Island, with which it is connected by very shallow water. Shoal water extends north from Round Island, its outer end being about 660 yards northeast of Round Island Light.

Light.—A flashing red light, 53 feet above water, visible 15 miles, is shown from a red square tower on a dwelling on the northwest end of Round Island.

Fog signal.—The fog signal is made on a steam whistle.

Light buoy.—A black spar-shaped buoy, showing an occulting white light is moored in 10 feet at the outer end of the shoal northward from Round Island.

There is an available width of 400 yards of deep water through the passages between Round and Mackinac Islands. Vessels using this passage must pass northward of the light buoy moored on the shoal extending northward from Round Island.

Majors Shoal, a dangerous rocky reef, 430 yards long east and west, with least depth of 9 feet, lies $2\frac{1}{2}$ miles southwest by west from Round Island Light, to southward of the vessel course from that light to Old Mackinac Point Light.

Buoy.—A red and black striped can buoy marks the eastern end of the shoal.

Directions—South Channel.—On account of Poe Reef and the shoals off Cheboygan Light, the recommended sailing course through the Straits is 270° (W. $\frac{1}{4}$ N.), passing 660 yards to southward of Poe Reef Light Vessel. Carry this course from abreast the light vessel, 4 miles; when on the line of the Cheboygan Range Lights, change to 300° and carry this for $16\frac{1}{2}$ miles, until Old Mackinac Point Lighthouse bears 180° (S. $\frac{1}{4}$ W.). When on the turning point opposite Cheboygan, the Cheboygan Lighthouse bears 152° (SSE. $\frac{1}{4}$ E.) $1\frac{1}{2}$ miles distant.

McGulpin Point is 2 miles to the westward of Old Point Mackinac, the shore between forming a shallow bight, with shoal water, least depths 9 and 10 feet and which in some instances extend 1,320 yards offshore, open to the northward. The point is bluff, steep-to, and faces the northwest for over 1 mile.

The stretch of water between Point St. Ignace and Point la Barbe, on the north, and Old Point Mackinac and McGulpin Point, on the south, is the narrowest portion, and constitutes the Straits of Mackinac proper.

Coast.—From McGulpin Point the coast trends about southwest by west for $1\frac{1}{4}$ miles, and is steep-to. Close to the shore the depth is from 7 to 9 feet.

From the southwest extremity of the point the shore recedes to the southward and eastward for 1 mile, with 5 feet at the extremity of

the small point there, then east for 880 yards, then curving abruptly southwest for $2\frac{1}{4}$ miles, and then northwest for 1 mile, forming a bay $2\frac{1}{4}$ miles wide and 1 mile deep into the land, with shoal water extending out from the shore for nearly 1 mile.

This bay affords protection from all winds except those from north to west, the depths varying from 3 feet, close up to the shore, to 17 feet on the edge of the shoal. A rock showing 1 foot above water is located 440 yards 151° (SSE. $\frac{1}{2}$ E.) from the southwest point of the bay. From here the coast takes a general westerly direction for $9\frac{1}{4}$ miles to Waugoshance Point, with two shallow bights, Cecil and Big Stone Bays, respectively, open to the northwest.

This part of the coast should not be approached within 1 mile, and as the extremity of Waugoshance Point is neared a much wider berth should be given it.

Cecil, Mich., on Cecil Bay, about 4 miles southwest of McGulpin Point, is a small lumber village at which the Emmet Lumber Co. has a mill, with a dock extending out to 10 feet of water. Vessels can lie on either side of the dock, which is sheltered from all southerly or easterly winds. Vessels should approach the dock on a 156° (S. S. E.) course, with the St. Helena Lighthouse nearly over the stern. This will clear large boulders which lie in 20 feet of water off the point just east of the dock.

Waugoshance Point, a long, low, and narrow point, extends westward from the mainland for 2 miles, and is farther continued by several small islets. The point is the top ridge of a long shoal, which extends out from the mainland for $6\frac{1}{4}$ miles to Waugoshance Lighthouse Tower, the shoal having a mean breadth of 2 miles. Waugoshance Island, 2 miles westward of the extremity of the point, is 1 mile long east and west and 590 yards broad.

Waugoshance Lighthouse Tower (light discontinued in 1912) is on the end of this shoal bank and to the southeastward of the turning point from the Straits of Mackinac into Lake Michigan through the passage between Beaver Island and the mainland.

Caution.—In rounding Waugoshance Shoal do not pass between Waugoshance Lighthouse Tower and the island; keep a lookout for Vienna Shoal and give it a good berth.

About 1 mile from west Waugoshance Point, the shoal has a width, north and south, of $2\frac{3}{4}$ miles.

Between Waugoshance Island and the point the shoal has depths of from 1 to 4 and 5 feet only, while a number of small islets and rocks are scattered about. North of the island, for about 1 mile, the shoal has depths of only 5 or 6 feet, and from this point 880 yards to the edge, it varies from 10 to 16 feet. Due west of the island the shoal extends for $1\frac{1}{4}$ miles with varying depths of 7 to 16 feet.

Rose (Waugoshance) Shoal consists of several patches of 13 to 20 feet, lying 1 mile and upward between north and northwest from Waugoshance Lighthouse Tower. They lie almost on a line between Waugoshance Lighthouse Tower and White Shoal Light, and nearly on a line between St. Helena Lighthouse and Grays Reef Light Vessel. The latter range will be useful in rounding the shoal at night. Deep-draft vessels should not pass south of Rose Shoal.

Buoy.—The northwestern edge of Rose Shoal is marked by a black spar buoy.

New Shoal No. 1, the most easterly of the Rose Shoal group, is the largest of the three, and is composed of cobblestones and bowlders, with a least depth of about $15\frac{1}{2}$ feet lying about $2\frac{1}{2}$ miles northwestward of Waugoshance Lighthouse Tower.

Light buoy.—A black conical buoy, showing an occulting white light, is moored in 57 feet, marking the northern side of New Shoal No. 1. A black spar buoy is moored alongside the light buoy.

New Shoal No. 2, with least depth of 18 feet, is about midway between New Shoals No. 1 and 3.

Buoy.—A black spar buoy marks the northern edge of the shoal.

New Shoal No. 3, the most westerly of the Rose Shoal group, has a least depth of about 16 feet and lies $2\frac{1}{4}$ miles northwestward of Waugoshance Lighthouse Tower.

Buoy.—A black spar buoy is moored at the western end of the shoal.

Light buoy.—A black conical buoy, showing an occulting white light, is moored in 58 feet about 3 miles northwestward of Waugoshance Lighthouse Tower.

A black spar buoy is moored alongside the light buoy.

Note.—The two light buoys marking the northern side of Rose Shoal group and the spar buoy marking New Shoal No. 2 may be passed close to on the north side by vessels going to or from Old Mackinac Point Light.

Caution.—Vessels drawing more than 14 feet of water are recommended to pass to the northward of Rose Shoal buoy. The passage between Waugoshance Lighthouse Tower and Waugoshance Island is practicable for small vessels only and should not be attempted without local knowledge.

Under no circumstances should vessels approach Waugoshance Lighthouse Tower closer than 1,320 yards, with it bearing to the westward of 248° (W. S. W. $\frac{1}{4}$ W.), nor should they bring the lighthouse tower to bear to the northward of 23° (N. N. E. $\frac{1}{4}$ E.) when standing to the southward, as the reefs are very foul with bowlders.

Vienna Shoal.—This shoal is about 290 yards long east and west and 175 yards wide. The shoalest spot, with $12\frac{1}{4}$ feet on it,

lies $1\frac{1}{2}$ miles 253° (W. S. W. $\frac{1}{2}$ W.) from Waugoshance Lighthouse Tower.

Buoy.—A black spar buoy marks the northwest end of the shoal.

NORTH SHORE.

General description.—From Point Detour the north shore of the Straits of Mackinac trends in a westerly direction to the head of St. Martin Bay, then it abruptly changes its direction to nearly south to St. Ignace Point. From this point to Point La Barbe the trend of the coast is west-southwest, thence to Point aux Chenes it takes a northwesterly direction. From Point St. Ignace to Point aux Chenes the coast is clear of danger at the distance of 1 mile, excepting the Graham Shoals.

For descriptions of Spectacle and Reynolds Reefs see Chapter III.

Point Detour is a long, narrow peninsula forming the southwest entrance to Detour Passage and northeast entrance point to the Straits of Mackinac. A 15-foot shoal lies 880 yards southwest of the point.

Light.—A flashing white light, 80 feet above water, visible 17 miles, is shown from a white skeleton tower on the southern end of Point Detour.

Fog signal.—The fog signal is made on a steam whistle.

Submarine bell.—A submarine fog bell is located about 1,750 yards southeast by east from the lighthouse.

Buoy.—A black can buoy marks the position of the submarine bell.

Detour Reef, a rocky shoal, with a least depth of 16 feet, lies with the southerly end about 1,170 yards southeast by east from Point Detour Lighthouse.

Light and bell buoy.—A black conical buoy, showing an occulting white light, is moored in about 24 feet and marks the extremity of Detour Reef.

Fog signal.—The fog signal is made on a bell sounded by the action of the waves.

St. Vital Point is 4 miles west of Point Detour, the shore between receding to the northward, forms St. Vital and Carlton Bays, which are open to the southward.

Shallow water extends 1,100 yards easterly into St. Vital Bay and about the same distance southerly from the northeast point of the bay; between these two banks there is deep water to within 880 yards of the head of the bay.

Shoals.—Two detached shoals, with 20 and 15 feet on them, lie, respectively, $1\frac{1}{2}$ and $1\frac{1}{2}$ miles eastward from the extremity of St. Vital Point.

Beaver Tail Point.—About 8 miles westward of St. Vital Point is Beaver Tail Point. There are several outlying shoal patches here, and the shore should not be approached within $1\frac{1}{2}$ miles. At $1\frac{1}{2}$ miles west of St. Vital Point is Saddlebag Island, and, $3\frac{1}{2}$ miles farther westward, Albany Island, with shoal places between along the coast. Between St. Vital Point and Beaver Tail Point are a number of rocky shoals and islets, rendering care necessary in approaching the shore.

A detached shoal, with 17 feet least depth on it, lies about 880 yards southwest of Saddlebag Island.

Another detached shoal with 13 feet least depth on it, lies about 1 mile west of Saddlebag Island.

Beaver Tail Reef, about 1,540 yards long north and south, is a narrow shoal with a least depth of 5 feet on it. It lies a little over 1 mile east-southeast from Beaver Tail Point and 1 mile from the shore to northward.

A detached shoal with 17 feet least depth on it lies close eastward of the reef.

Martin Reef, with its southeastern or outer extremity situated 4 miles 160° (S. by E. $\frac{1}{2}$ E.) from Beaver Tail Point, is a rocky shoal, 1 mile long northwest and southeast with patches having depths of 1 to 13 feet. This reef is a menace to navigation, as it lies near the track of vessels from Detour Passage to Mackinac Island.

Martin Reef Light Vessel shows a fixed white light, 35 feet above the water, visible 13 miles. It has a black hull, two masts, red circular day mark at foremast head: "Martin" on both sides; approximate position Lat. $45^{\circ} 54' N.$; Long. $84^{\circ} 08' W.$ about 880 yards south of the reef.

Fog signal.—The fog signal is made on a steam whistle.

Submarine bell.—A submarine bell is carried by the light vessel. (See Light List.)

Tobin, Surveyors, and Pomeroy Reefs.—From Martin Reef, Tobin Reef with a least depth of 2 feet, Surveyors Reef with a least depth of 1 foot, and other detached shoals with scant depths extend in a northwesterly direction to the mainland, with channels between them which should not be attempted by strangers. Pomeroy Reef is about 1,170 yards long and 335 yards wide on the 24-foot curve, lying parallel to Tobin Reef and about 1,750 yards south-southwest of it. The least depth over it is 13 feet, near the west end of the reef.

Coast.—Between Beaver Tail Point and Fuyards Point, 10 miles to the westward, is a large indentation in which are several large and small islands, the principal ones of which are Strong, Boot, La Salle, and Marquette, the latter a large island with Marquette Bay on the northwest side. Among these islands are many inlets,

Scammon's Harbor being the largest, but, on account of off-lying shoals and numerous rocky patches, they are practically useless except for small craft, and larger vessels should keep well outside.

Scammon's Harbor.—The entrance to this harbor is between Boot Island on the east and Government Island on the west. Off the southeast end of Government Island is Penny Island, a small rocky islet, from which a spit extends 1,100 yards in a southeasterly direction, with large bowlders on it, and there is a rocky flat on the northeast side of this islet. When inside there is plenty of room, and protection from all winds. The water is deep in the entrance, but strangers should be very cautious in making it.

Light.—A privately maintained light, visible 5 miles, is situated on the southern end of Island No. 8.

Buoy.—A black spar buoy is moored near the extremity of the spit projecting southeastward from Penny Island.

Directions.—To enter the harbor, bring the passage to bear 326° (NNW. $\frac{1}{4}$ W.), and run in on that bearing. Keep to the starboard side about one-third the distance across the channel, and when a little past the west point of Boot Island haul to the north to clear a spit off a little point on the opposite side of the channel, and, when in the bay, haul to the northwest and anchor in 7 fathoms, mud and clay bottom.

Goose Island, $2\frac{1}{2}$ miles west-southwest of Point Fuyards, is surrounded by shoals; a reef extending for over 1 mile from its southern end. From the eastern side shoals extend out 440 yards with deep water between them and Marquette Island. From the western side shoals extend off nearly 1,320 yards to the westward and southward and about 1 mile to the southward. This side of the island should not be approached within 1 mile.

Goose Island Shoal.—About 3 miles 242° (SW. by W. $\frac{1}{4}$ W.) from Goose Island is a 4-foot patch, with a 6-foot patch a short distance north of it. This shoal is 1,100 yards long, north and south, and 880 yards in breadth, being nearly circular in shape. It should be carefully avoided in navigating this part of the Straits. It lies in range of Fort Mackinac and the middle of Goose Island, and also in the range of Bois Blanc Light and the west tangent of St. Martin Point.

Buoy.—A red and black can buoy is moored on the western edge of the shoal.

Brulée Point.—Between the northwest shore of Marquette Island and Brulée Point, $1\frac{1}{2}$ miles distant, is an indentation forming Marquette and other bays; at the head of Marquette Bay is the village of Hessel. There is deep water in these bays, with many shoal spots, and they are only suitable for small craft, but the water shoals considerably at the head of the bay for fully 1 mile from shore. Marquette Bay has good anchorage and protection from all winds. The

entrance point is $2\frac{1}{2}$ miles from north point of Goose Island. To enter the bay, haul around the west point, giving it a berth of 300 yards, and come-to in 4 or 5 fathoms.

Buoy.—A black spar buoy marks the extremity of the shoal water extending southeast from Brulée Point.

Search Bay.—West of Brulée Point the shore recedes, forming Search Bay, open to the southward, its western boundary being St. Martin Point. The bay has deep water up to within 1,320 yards from its head and 660 yards from the shores in the outer portion, no offlying dangers, and would serve as a shelter from northerly winds.

St. Martin Point, forming the eastern boundary of St. Martin Bay, is steep-to, and has a deep-water channel between it and St. Martin Point Reef. Vessels should give the point a berth of 1 mile.

St. Martin Point Reef, $1\frac{1}{2}$ miles long east and west and having rocks nearly awash, lies with its outer edge 1,540 yards south of St. Martin Point. The maximum depth between the point and the reef is about 18 feet.

St. Martin Bay.—Between St. Martin Point and Grosse Point is St. Martin Bay, a large bay free from shoals and with deep water. It is protected from all winds from east to south by way of north and from southeast winds partially by St. Martin and Big St. Martin Islands. Between these islands and the mainland are three channels into the bay, all having deep water. There are several rivers flowing into this bay at its head, the largest being the Pine and Carp Rivers. On the eastern and northwestern sides of the bay the water shoals at 1 to $1\frac{1}{2}$ miles from shore. At Grosse Point shoal water extends out due east for about 880 yards and for 1 to $1\frac{1}{2}$ miles eastward from the shore southward of the point.

Carp River, in St. Martin Bay, is 12 miles north of Point St. Ignace. There is good anchorage off the mouth of the river; vessels can lie there in any weather. To make the anchorage from the west side of Mackinac Island steer north in mid-channel between Big St. Martin Island and Grosse Point, and when past the point steer 354° (N. $\frac{3}{4}$ W.) $3\frac{1}{2}$ miles. Come-to in $3\frac{1}{2}$ fathoms off the mouth of the river. To make the mouth of Carp River from the east when 880 yards north of Bois Blanc Light steer 309° (NW. $\frac{3}{4}$ W.) 15 miles, keeping Grosse Point a little open to the starboard bow. When the middle of the channel between Big St. Martin Island and Grosse Point bears north haul up on that bearing, and when past the point steer 354° (N. $\frac{3}{4}$ W.) $3\frac{1}{2}$ miles until abreast of the river.

St. Martin Island, nearly circular in shape, over 1 mile in diameter, lies $1\frac{1}{2}$ miles to the westward of St. Martin Point, the channel between being perfectly safe if a middle channel course is kept.

From the south and southwest sides of this island shoal water extends out for nearly $1\frac{1}{2}$ miles, and these sides of the island should be given a good berth in rounding it. From 7 to 14 feet may be found, except about 880 yards due south, where 2 to 13 feet is encountered in several places; the rest of the island is steep-to, deep water approaching to within 335 yards.

Big Martin Island, $1\frac{1}{2}$ miles west of St. Martin Island, is nearly 2 miles long north-northwest and south-southeast and $1\frac{1}{2}$ miles broad at its widest part. Shoals extend off 880 yards from the several points of the island. The channel between the islands is deep and safe. A course should be kept a little nearer to St. Martin Island after passing the shoals extending from that island. This course will clear the spit extending 880 yards off the low east point of Big St. Martin Island.

The channel west of Big St. Martin Island is also deep and safe in mid-channel. Shoal water extends to the eastward from Grosse Point and to the westward from the northwest point of Big St. Martin Island.

Coast.—Between Grosse Point and Rabbits Back Peak, 4 miles to the southward, the coast recedes, forming a bay open to the eastward, with shoal water extending 1,540 yards from shore in the northern part. There are two rocky patches just off the small point 880 yards to the southward of Grosse Point. South of Rabbits Back Peak is a small bight of shoal water, open to the southeast which is shallow for 1,320 yards offshore; thence the coast trends south-southeast for 4 miles to Point St. Ignace, with East Moran Bay, which is small and open to the eastward, $1\frac{1}{2}$ miles northwest of the point, with depths of 9 to 14 feet.

St. Ignace is located on East Moran Bay, and has several railroad and other docks projecting into it, being the terminus of the Duluth, South Shore & Atlantic Railroad, and the Detroit, Mackinac & Marquette Railway. There is good water at the docks.

A detached shoal with $17\frac{1}{2}$ feet on it lies close east of the end of the railroad wharves.

The original settlement was founded by Marquette, in 1671, and two years later the French built a fort there. In 1714 a fort was built at old Mackinaw, on the south side of the Strait, the post at St. Ignace having been abandoned several years before. The town of St. Ignace was founded in 1882 and is connected by a railroad transfer ferry with Mackinaw. Population about 2,500.

Lights.—A fixed white light is shown from the end of the Duluth, South Shore & Atlantic Railroad northern dock and a fixed white and red light from their dock next south of the northern.

Fog signal.—The fog signal is made on a bell.

The lights and fog signal are privately maintained.

Mackinac Island, 1,320 yards northwest of Round Island Light, is 3 miles long northwest and southeast and about 2 miles broad. Its southern part, on which is the town and fort of Mackinac, forms the northern shore of the narrowest part of the Straits of Mackinac.

The island is very bold and the shores are generally rocky and deep-to.

A detached shoal about 500 feet in diameter, with a least depth of 16 feet, rising abruptly in 12 fathoms or more, is located about 2 miles 14° (N. by E. $\frac{3}{4}$ E.) from the southeasterly bluff point of Mackinac Island and about 1.3 miles from the nearest shore of the island; the bottom is very irregular with numerous large boulders.

Radio.—A radio station is maintained on Mackinac Island by the United States naval communication service. The call letters are N U D. The station transmits on a 975-meter wave length and listens on a 600-meter wave length.

Mackinac Harbor.—The city of Mackinac Island is located on the shores of the semicircular bay in the southeast end of the island, opening toward the southeast between Biddle Point on the west and Mission Point on the east and having an area of about 34 acres. There are two landing wharves and a coaling station. There is about 18 feet of water in the harbor to the wharves. While protected by Mackinac and Round Islands from northerly and southerly winds, the harbor is subjected to quite heavy seas through the Straits when the wind has an easterly or westerly direction.

The water front of Fort Mackinac comprises nearly one-third of the water front of the whole harbor.

A spit extends off the south point of Mackinac Island, in a southeasterly direction. Another spit extends in a similar direction from the east point of the island, which with the bay between the two points form Mackinac Harbor.

Breakwaters.—Two rubble-mound breakwaters extend, respectively, from Biddle and Mission Points, the one extending southeasterly at Biddle Point being 850 feet long and the one extending southerly at Mission Point being 400 feet long.

Coast Guard station.—A Coast Guard station is located at the extreme southern end of the island.

Light buoys.—A red conical buoy, showing an occulting red light, is moored in 29 feet about 300 feet south of the end of Biddle Point breakwater. A red conical buoy, showing an occulting white light, is moored in 24 feet about 670 yards east-northeast of the extremity of Mission Point breakwater and marks the southeastern edge of the shoal bank off the point.

Storm-warning station.—Day and night signals are displayed from a steel tower at the extreme southern end of Mackinac Island, opposite Round Island Light.

Anchorage.—Good anchorage is found in the harbor anywhere north of the range of the north pier in from 3 to 5 fathoms of water. The docks extend out about 500 feet east-southeastward and have about 16 feet of water at their outer ends.

There are no pilots, but tugs are available.

Directions—From the eastward.—Head about for the middle of the island until within 1 mile, then steer for the middle of the passage until the docks are ranged, when haul up for them, giving the southeast point of the island a berth of 440 yards, passing to southward of the light buoy moored off Mission Point.

From the westward.—Should the light buoy off the southwest point of the island not be seen, open up Bois Blanc Light, a point on the starboard bow, until the South Pier bears north, when haul up for the docks.

For clearing the spit off the southwest point of the island, a good range is with the blockhouse on Fort Mackinac in range with the South Pierhead.

Vessels should not attempt to pass between the light buoy and the island, at the same time taking care to avoid the shoal to the north-westward of Round Island.

In thick weather it is a very difficult matter to make the harbor; vessels sometimes find it necessary to send in a boat to locate the position of the light buoy.

Current.—During the prevalence of strong easterly or westerly winds a strong current sets through the channel between these islands, sometimes as great as 6 or 8 knots an hour. In the harbor, inside the range of the points, the current is usually contrary to that in the passage and is caused by the eddy.

Mackinac.—The town of Mackinac, at the southeast end of the island, is on the north channel of the Straits of Mackinac. Many larger passenger and transient steamers stop here. The town is a coaling station, and is a great resort for invalids and tourists.

Point St. Ignace forms the southern entrance point of East Moran Bay. The eastern side is steep-to while from the southern shoal water extends farther offshore.

North Graham Shoal, 1,425 yards long by 495 yards in maximum width on the 20-foot curve and with least depth of $4\frac{1}{2}$ feet, lies 1,320 yards south-southeast from Point St. Ignace.

Buoy.—A red nun buoy marks the eastern extremity of the shoal.

South Graham Shoal, 1,040 yards long by 710 yards wide in size on the 20-foot curve, and with least depth of 2 feet, lies $1\frac{1}{2}$ miles southward from Point St. Ignace.

The summits of North and South Graham Shoals lie 1,320 yards apart in a northeasterly and southwesterly direction, but there are

detached shoals with 16 to 20 feet depth between the two. There is a well-defined channel between them and the mainland, which can be run on the range between McGulpin Point and the north tangent of Mackinac Island; its clear width between 21-foot curves is 335 yards.

Light and bell buoy.—A red conical buoy, showing a flashing white light, is moored in 24 feet on the southern edge of South Graham Shoal. Vessels should pass to southward of this buoy.

Fog signal.—The fog signal is made on a bell sounded by the action of the waves.

Currents.—The currents in the vicinity of the Graham Shoals and the Straits are often strong and irregular; after fresh gales anchored vessels frequently trend to windward.

Coast.—From Point St. Ignace the coast trends west-southwest for $2\frac{3}{4}$ miles to Point La Barbe; thence it changes its direction to northwest for 3 miles to West Moran Bay. All this coast is bordered with shoals and rocky patches, extending out for 1 to $1\frac{1}{4}$ miles from the north shore of the bight east of Point la Barbe, and should not be approached within 1 mile.

Green Island is about 440 yards long northeast and southwest and lies with its center about 660 yards southeast of Point la Barbe.

Northwestward from Point la Barbe the shore is shoal from 1,320 yards to 1 mile off as far as West Moran Bay.

West Moran Bay is open to the southward and westward and is clear of dangers, the charts showing a least depth of 10 to 17 feet close inshore. It affords protection for small craft from all winds from north to east.

A detached shoal about 1 mile long northwest and southeast, having a maximum width of 440 yards near the center and a minimum depth of $12\frac{1}{4}$ feet, lies in front of the bay. There is a narrow channel north of this shoal.

From West Moran Bay the coast is bluff, bending to the northward as far as Gros Cap, and is steep-to; thence it takes a northwesterly direction for 4 miles to Point aux Chênes, becoming low and broken by inlets with shoal water extending off some distance. From Point aux Chênes the coast trends northwesterly into Lake Michigan.

St. Helena Island is situated $1\frac{3}{4}$ miles southwesterly off the bluff shore at Gros Cap and is 1 mile long northwest and southeast by about 660 yards in greatest width. From the southeastern end of the island a very shoal bank extends about 880 yards to the southeast. In approaching from the westward this end of the island should be given a wide berth. There is deep water between this island and the mainland.

Light.—A fixed red light, 71 feet above water, visible 13 miles, is shown from a white, conical tower connected with a dwelling on the southeast point of St. Helena Island. This light leads vessels seeking a lee under St. Helena Island or bound northwestward through South Channel, Straits of Mackinac.

Buoy.—A black spar buoy marks the outer end of the shoal water extending southeastward from St. Helena Island.

St. Helena Harbor lies on the northeastern side of the island, about midway between the extremities. A small wharf projects from the northern shore of the harbor.

Caution.—Do not attempt to round the northwestern end of St. Helena Island at night unless its appearance under Gros Cap and the position of St. Helena Shoal are well defined and understood.

In rounding the southeastern end of the island at night remember that the buoy marking the reef extending southeastward from the island is about 1,000 yards from the light.

Directions.—Running in for an anchorage, bring McGulpin Point to bear 146° (SSE. $\frac{1}{2}$ E.) and then keep it right astern. Approaching from the westward, give the southeast end of the island a wide berth, as the St. Helena southeast shoal extends about 880 yards from the southeastern end of the island.

To pass to the northward of the island, bring Waugashance Lighthouse Tower to bear 180° (S. $\frac{1}{2}$ W.) and distant $2\frac{3}{4}$ miles, then steer 73° (ENE. $\frac{1}{2}$ E.) until the extreme western tangent of St. Helena Island bears 90° (E. $\frac{1}{2}$ S.) distant 660 yards. Round the northwest shore of the island at 660 yards and when the extreme north tangent of the island bears 180° (S. $\frac{1}{2}$ W.) haul to the southeastward and come to off the dock.

St. Helena Shoal lies with its narrow eastern extremity about $1\frac{1}{2}$ miles west of the northwest end of St. Helena Island, and thence it reaches westward nearly $1\frac{1}{2}$ miles, being about 880 yards in greatest extent north and south, with depth of $6\frac{1}{2}$ to $18\frac{1}{2}$ feet over rock and deep water around it.

Buoy.—A red and black can buoy, horizontally striped, marks the southern edge of St. Helena Shoal.

Coast.—Between Gros Cap and Point aux Chênes the shore is deeply and irregularly indented by inlets containing rocky shoals of scant depth, lying within a line joining the two headlands, and there are also numerous outlying patches to the south and west of Point aux Chênes.

Shoals.—A shoal, with 17 feet least depth, lies $2\frac{1}{2}$ miles south of Point aux Chênes. Another shoal lies just westward of it.

Directions—North Channel.—If intending to enter Lake Michigan from Point Detour by way of the north channel—a course 255°

(WSW. $\frac{1}{4}$ W.) for 26 miles from Detour Reef light and bell buoy should lead to a point 2 miles north of Bois Blanc Lighthouse, when change course to 271° (W. $\frac{1}{4}$ N.) for 9 miles, which should lead to the passage between Mackinac Island and Round Island.

If intending to enter by the south channel from the above point, a course 228° (SW. $\frac{1}{2}$ W.) for $17\frac{1}{2}$ miles will lead to 1 mile west of Spectacle Reef Lighthouse, when change course to 238° (SW. by W. $\frac{1}{4}$ W.), passing southward of the Poe Reef Lightvessel to south channel entrance.



CHAPTER XVI.

LAKE MICHIGAN, EASTERN SHORE—GENERAL REMARKS—WAU-GOSHANCE POINT TO CHICAGO.

The depths herein given are referred to low-water datum, the reference plane for United States river and harbor improvements, which for Lake Michigan is an elevation 579.6 feet above mean sea level. Depths on the Lake Survey charts, referred to standard low water, are 1 foot less than those herein published.

General description.—Lake Michigan is the largest lake wholly within the United States and the second largest known body of fresh water in the world.

Lying in a north and south direction, it extends from latitude $41^{\circ} 37'$ N. to $46^{\circ} 05'$ N., and is about 325 miles long, and its widest part, which is abreast Milwaukee, is about 90 miles. Its surface is about 581 feet above the level of the sea, its area is about 22,400 square miles, and its total shore line is about 950 miles. Its greatest recorded depth is 870 feet.

It forms the eastern boundary of Wisconsin and the western boundary of the Lower Peninsula of Michigan and touches parts of Illinois and Indiana.

The Straits of Mackinac connects this lake with Lake Huron. It is connected by canal with the Illinois River to the Mississippi River, and so with the Gulf of Mexico.

The shores of Lake Michigan are generally low and sandy and the land slopes gradually to the lake. The northern shore of the lake is irregular and more rugged and picturesque than the other shores, the summit of the highest peak being about 1,400 feet above the sea. On the eastern side are numerous sand hills formed by the wind into innumerable fantastic shapes, sometimes covered with stunted trees and scanty vegetation, but most generally bare and rising to heights of from 150 to 250 feet. The southwestern shore is generally low, with sand hills covered with shriveled pines and bur oaks. Along the western shore woods and prairie alternate, interspersed with a few high peaks. The cliffs on the east shore of Green Bay form a bold escarpment, and from this ridge the land slopes gradually to the lake.

With the exception of Green and Traverse Bays, Lake Michigan has few indentations in its coast line, and, excepting the north end,

it is free from islands. The waters near shore are shoal, and, having few harbors, it is dangerous navigation in heavy blows.

Around the lake the climate is quite equable, for, though the winter is cold and the summer hot, the waters of the lake modify the extremes. The mean temperature around the lake varies from 46° to 54°. The average annual rainfall is 32 inches. The mean barometer varies from 29.5 to 30.01.

Snow falls in the north before the occurrence of the heavy frosts. The northern part of the lake only is covered with ice in winter and it never reaches as far south as Milwaukee. Milwaukee River remains closed on an average 100 days, from the end of November to the middle of March.

The average date of the opening and closing of navigation at the Straits of Mackinac, which longest retain the ice, is April 12 and December 15, respectively.

RESOURCES.

The finest agricultural land in the United States is near the lake, and there is an immense trade in all grains, fruits, live stock, and lumber, and their products, as flour, pork, hides, leather goods, furniture, etc. Rich lead and copper mines abound, as also salt, iron, and coal. Abundant water power promotes manufactures of all kinds. Fine building stone is obtained from numerous quarries.

CURRENTS.

The currents in the Great Lakes are grouped under three heads:

1. The main currents:

A general set of the water toward the outlet exists in each of the Great Lakes, forming a continuous current in that direction.

The outlet of Lake Superior being on the southern side, this current hugs the southern shore. In Lake Michigan it hugs the eastern shore, the readiest access to the outlet being on that side, owing to the position of the islands at its northern end. The same rule holds good in Lake Huron as regards the western shore. In Lakes Erie and Ontario this phenomenon is not so plainly marked.

2. Surface currents:

These are due to the prevailing winds, which have always been recognized as influencing the motion of currents in large bodies of water:

3. Return currents:

The outlets of the lakes being small and insufficient for the escape of all the water banked up by the wind, return currents are inevitable.

The theory has often been propounded that many ocean currents arise from the above cause, the water driven before the wind making the current and the piled-up water seeking an escape forming the return current.

CURRENTS IN LAKE MICHIGAN.

A fresh wind of several days' duration is well known to be of importance to the general shallow harbors of the lake. Such a wind has a well-recognized effect on the depth of water in the Chicago River.

As a result of experiments, it has been found that a main current exists in Lake Michigan, setting down the west coast about 10 miles offshore, sweeping around the south end, and stretching to the northward close to the east coast. Hugging the east shore, the current sweeps through the narrow passage east of the Manitou Islands, and thence by the Straits of Mackinac into Lake Huron, forming a whirl around the Beaver Island group on its way to this outlet.

This current is more clearly and strongly marked on the east shore than elsewhere, and it is to this that the freedom from extensive shoals and bars off the east coast is due, while broad shallows line the west coast.

There is a whirl around Beaver Island in a direction contrary to the hands of a watch.

The average speed of the current was found to be 4 to $4\frac{1}{2}$ miles per day. Through Manitou Passage the velocity was from $6\frac{1}{2}$ to 10 miles per day.

WINTER NAVIGATION.

Winter navigation on Lake Michigan is considerable and is increasing.

Regular winter lines are maintained between the following ports:

Milwaukee to Racine and Chicago.

Milwaukee to Sturgeon Bay canal.

Milwaukee to Grand Haven.

Milwaukee to Ludington and Manistee.

Milwaukee to Muskegon.

Manitowoc to Ludington.

Manitowoc to Frankfort.

Kewaunee to Ludington.

Frankfort to Manistique.

Ludington to Manistique.

Chicago to Grand Haven and Muskegon.

Kenosha to Waukegan and Chicago.

Efforts are being made to maintain other winter lines.

The route from Mackinaw City to St. Ignace is generally kept open all winter by car ferries.

Plan.—The plan of this chapter is to work southward on the eastern shore from the Straits of Mackinac to Chicago.

East shore—Natural conditions and scope of improvements.—The east shore of Lake Michigan is generally composed of fine sand, large quantities of which are set in motion by severe on-shore winds and storms. Such harbors as existed before improvement were in the mouths of creeks or small rivers, or at the outlets of small lakes near the lake shore, and were either in their natural condition or partially improved by local enterprise. At many of them sufficient depths for large vessels existed within the shore line and in the main lake just outside, but the entrances were obstructed by extensive bars (generally close to the shore line), formed partly by the sand thrown up by storm waves or blown from the banks into the streams and carried down by the current, and partly by the sediment brought down from the upper watersheds. During the stormy season, when the harbors were most needed for shelter, the bars increased in height and extent, and although somewhat cut down by scour during the freshet period, they rendered the channels shifting and uncertain at all times.

Caution.—It is of especial importance to navigation interests to note that the dangerous storms of the fall, winter, and early spring are usually westerly, making entrance to the restricted harbor channels of the east shore especially difficult, and sometimes increasing dangers by the formation of storm bars.

Improvements.—The United States in 1836 began works of improvement at various harbors on the east shore, the chief object being the removal of the bars at the entrances. The invariable plan was to confine the current between parallel piers, walls, or jetties, suitably directed and a moderate distance apart, varying with the size of the stream and the needs of the harbor. Before improvement by the Government, depths at natural entrances varied from barely enough to permit the passage of small fishing boats, up to 11 feet at Muskegon and 12 feet at Grand Haven, at both of which places an increased depth had been secured by works constructed by local interests. In every case the channel was greatly improved by the Government operations, the bar being washed into deeper water; but with the extension of the piers into the lake the shore line advanced, the lake bottom was built up on both sides of the entrance by the sand set in motion by winds and currents and intercepted by the piers, and the entrance channel again shoaled, though usually not back to the original depth. This shoaling was followed by pier extensions and dredging, effecting the present channel depths, which, although invariably much greater than before improvement, are sometimes insufficient for the larger vessels of to-day. The natural processes which formed the original bars are still in operation and, as time

goes on, the channels deteriorate unless dredging on a large scale is resorted to or the piers extended; at some of them dredging is usually required each spring. Further extension of piers can in most instances afford but temporary relief at disproportionate cost; dredging is the only remedy adequate to maintain existing depths and to prevent further radical advance of the shore lines, and is proving effective.

Wave-stilling basins.—In recent years a special type of improvement has been adopted at harbors where storm waves were wont to roll through the piers and occasion such violent disturbance as to menace or damage property and vessels inside. These conditions have been relieved by the formation in the lake of a wave-stilling basin, inclosed by breakwaters or piers which converge to an entrance opening in deep water beyond the inner piers, this basin allowing the waves to expand and lose force instead of being conducted through the confined channel between the parallel piers. Such basins now exist on this shore at Holland, Ludington, and Manistee.

Government operations in the improved harbors on the east shore have obtained channels with low-water depths of from 14 to 20 feet, varying somewhat in proportion to the volume and importance of navigation at the various ports.

Harbor Springs, on the north shore of Little Traverse Bay, while limited in area, is one of the finest natural harbors of refuge on the lakes, affording security in any weather.

Petoskey Harbor, on the north shore of Little Traverse Bay, is formed by a detached breakwater which shelters the wharf from westerly winds, but is of little use in heavy weather.

Sturgeon Bay.—South of Waugoshance Point the shore recedes in a southeasterly direction for 5 miles and then for about 3 miles in a southwesterly direction, forming a large bay, known as Sturgeon Bay, open to the westward, the northern part of which is all shoal. At the northern end of the bay the shoal extends due west for about 2½ miles and in a southern direction for a distance of 1½ miles.

Cross Village.—A small village with a population of about 500 lies about 8 miles 202° (SSW.) from the mainland at Waugoshance Point.

Wharf.—There is a pier about 700 feet in length, with about 14 feet of water at the end.

Shoal.—Shoal water extends out to the westward for a distance of about 1½ miles. A patch with 18 feet on it lies about 880 yards northwest of the pier head. A detached shoal with 20½ feet on it lies nearly 1 mile northeastward of the pier head.

Directions.—Vessels in making a landing should keep well to the northward and approach the pier from the northwest; if overtaken

by bad weather while loading they should seek shelter under the lee of the neighboring islands.

From Cross Village to Seven Mile Point the coast presents no outlying danger and may be approached within 880 yards.

Grays Reef.—About 4 miles southwestward from White Shoal and $5\frac{1}{2}$ miles westward of Waugoschance Island is Grays Reef. The reef is the eastern extremity of an extensive shoal extending eastward from Hog and Hat islands. It consists of many detached rocky patches with $2\frac{1}{2}$ to 18 feet of water over them. With the exception of the 4-foot spot above mentioned, an 11-foot spot 660 yards south of it, and 13 feet on the extreme eastern edge of the reef, there is a least depth of 16 feet for 5 miles west from the eastern edge over the entire width of the shoal.

Due north of the western half of the reef, and $2\frac{1}{4}$ miles from the northeastern part of Hog Island, is Hat Island.

Grays Reef Light Vessel shows a fixed white light, 30 feet above water, visible 12 miles. It has a red hull, white bulwarks, two masts with a black daymark at foremast head and "Grays" on both sides. It is moored in about lat. $45^{\circ} 46' N.$, long. $85^{\circ} 10' W.$

Fog signal.—The fog signal is made on a steam whistle.

Submarine bell.—A submarine bell is carried by the light vessel.

Malletoa Shoal, a $18\frac{1}{2}$ foot spot, is located about 660 yards southwesterly from Grays Reef Light Vessel and is near the outer end of the Grays Reef shoal area.

Caution.—So many accidents have occurred in this vicinity that all deep-laden vessels in the Chicago trade are advised to pass to the northward of the Beavers to avoid risk of serious injury.

Grays Reef Shoal is a boulder reef about 665 yards southeasterly from Grays Reef Light Vessel. On the 24-foot curve this shoal is about 200 yards long east and west and about 65 yards wide, covered with small, smooth boulders, and the top of the highest boulder is at a depth of $18\frac{1}{2}$ feet. In its critical location the shoal is a menace to deep-draft vessels.

Light buoy.—A black cylindrical buoy, showing a flashing white light, is moored in 20 feet on the western edge of Grays Reef Shoal.

A black spar buoy is moored alongside the light buoy.

Between the light buoy and Grays Reef Light Vessel there is an ample width of deep water, which is the recommended passage for large vessels.

Middle Shoal, with $16\frac{1}{2}$ feet depth, lies about $1\frac{1}{2}$ miles 146° (SSE. $\frac{1}{2}$ E.) from Grays Reef Light Vessel, just east of the track of vessels bound to Grand Traverse Bay from the Straits of Mackinac.

Buoy.—The eastern side of Middle Shoal is marked by a red nun buoy.

East Shoal, with $17\frac{1}{2}$ feet depth, lies 1,540 yards about 110° (ESE.) from the nun buoy marking Middle Shoal.

Buoy.—A black spar buoy marks the western edge of East Shoal.

Shoal.—A bowlder reef, with least depth of about 16 feet, lies about 1,100 yards 22° (NNE. $\frac{1}{2}$ E.) from Middle Shoal nun buoy.

A patch with $19\frac{1}{2}$ feet on it lies about 1,100 yards eastward of East Shoal.

Note.—A wide passage with not less than 24 feet depth is available to the eastward of Middle Shoal, avoiding the shoals bordering it. Vessels will pass through unobstructed deep water by holding a course a little to eastward of a line from White Shoal Light to Ile Aux Galets Light, bearing 189° (S. $\frac{1}{2}$ W.).

Ile Aux Galets (Skilligallee) lies $7\frac{3}{4}$ miles about 216° (SW. $\frac{1}{2}$ S.) from Waugoshance Island. The shoal extends 1,320 yards northwestward from the lighthouse.

A narrow spit with 6 to 15 feet depth extends $1\frac{1}{2}$ miles 67° (ENE.) from the light, and a detached reef with $13\frac{1}{2}$ feet depth is just south of the spit and about $1\frac{1}{4}$ miles 101° (ESE. $\frac{1}{2}$ E.) from the light.

Light.—A fixed white light, 58 feet above water, visible, summer light, 15 miles, winter light, 12 miles, is shown from a white octagonal tower connected to a dwelling on Ile Aux Galets, $6\frac{3}{4}$ miles westward from Cross Village Pierhead. (See Light List.)

Fog signal.—The fog signal is made on a steam whistle.

Buoys.—A black can buoy marks the extremity of the shoal water extending northwestward from the lighthouse. A red spar buoy marks the extremity of the spit extending northeastward from the lighthouse.

Dahlia Shoal is situated about $3\frac{3}{4}$ miles 206° (SSW. $\frac{1}{2}$ W.) from Ile Aux Galets Light, has a least depth of $15\frac{1}{2}$ feet, and is about 880 yards long northeast and southwest.

Buoy.—A red and black can buoy marks the southern end of Dahlia Shoal.

Beaver Islands Group and adjacent shoals.—**Hat Island**, the most easterly of the Beaver Group, is a small island $10\frac{1}{4}$ miles 281° (WNW. $\frac{1}{2}$ W.) from Waugoshance Lighthouse tower and is surrounded by shoals, which extend 880 yards from its north side. The island and its shoals form part of the northerly limits of the foul ground extending eastward from Hog Island and terminating in Grays Reef, previously described.

Hog Island, $2\frac{1}{2}$ miles in a southwesterly direction from Hat Island, is $3\frac{1}{2}$ miles long north and south and of irregular width, varying from $\frac{1}{2}$ to $1\frac{1}{2}$ miles; it is low and wooded and entirely surrounded by very shallow flats, which reach northwesterly about 1 mile and southerly $1\frac{1}{4}$ miles from it. The shoal water east of Hog

Island terminates in Grays Reef, previously described. On the west side a bank connects the southerly ends of Hog and Garden Islands, 3 miles westward, with no passage for vessels across it. This bank extends $1\frac{1}{4}$ miles south of a line connecting the southerly ends of the two islands.

Hog Island Reef is a detached shoal, with 8 feet least water on it, $3\frac{1}{4}$ miles 157° (S. by E. $\frac{1}{4}$ E.) from Hog Island.

Buoy.—A red and black can buoy marks the eastern side of the reef.

Garden Island, between its southeasterly and northwesterly extremities, has a length of 5 miles, and owing to irregular projections along its sides it varies in width from $1\frac{1}{4}$ to $2\frac{1}{4}$ miles, receding to a point at either end. The island is generally low and wooded, but higher at the north end, and is surrounded by shoal water.

Garden Island Shoal.—About $2\frac{1}{2}$ miles 36° (NE. $\frac{1}{4}$ N.) from the northwesterly point is Garden Island Shoal, running about $1\frac{1}{2}$ miles east and west, with depths of 15 to 21 feet.

Light and bell buoy.—A red and black cylindrical buoy, showing a flashing white light, is moored in 18 feet on the northeast end of Garden Island Shoal.

Fog signal.—The fog signal is made on a bell sounded by the action of the waves.

Reef.—About midway between the island and the shoal is another reef about 1 mile long in an east-southeast and west-northwest direction, with 16 to 18 feet of water over it.

Squaw Island, the most northerly of the Beaver Group, lies with its southerly end 3 miles 277° (W. $\frac{1}{4}$ N.) from the northwesterly extremity of Garden Island and is about 880 yards long to its north end. A bank about 1,320 yards wide skirts the east, south, and west shores of the island. From the north side a shoal with depths under 18 feet reaches $1\frac{1}{4}$ miles in north-northeasterly direction. A 15-foot shoal, detached from this bank, bears northeast by east $1\frac{1}{4}$ miles from Squaw Island Light. Detached rocky spots with 18 to 22 feet depth over them are found 1 mile northwest of the light.

Light.—A fixed and flashing red light, 57 feet above the water, visible, fixed 10, flashing 14 miles, is shown from a red octagonal tower attached to a dwelling on the north point of Squaw Island.

The winter light is flashing red, visible 8 miles.

Fog signal.—The fog signal is made on a steam whistle.

Buoys.—A black spar buoy marks the outer edge of the bank extending eastward from the island.

A black can buoy marks the outer edge of the shoal, extending north-northeastward from the island.

Whiskey Island, about 660 yards square, with its face bearing diagonally, is $1\frac{1}{4}$ miles southwest by south of Squaw Island and $3\frac{1}{4}$

miles west of the adjacent shore of Garden Island. Shallow water extends 880 yards from its shores generally and about 1,540 yards to the north and east of its east point.

Between Garden Island and Squaw and Whiskey Islands are numerous detached spots and patches with from 6 to 18 feet of water on them, which preclude safe passage, except for shallow draft.

Buoy.—A black spar buoy marks the limit of the shoal water eastward of Whiskey Island.

Bank.—About 1,100 yards off the southwesterly face of the island is an extensive bank $1\frac{1}{2}$ miles northwest and southeast by 1,100 yards wide. The shoal is awash a short distance northward of the buoy marking it.

Buoy.—A red spar buoy marks the southerly edge of the shoal.

Beaver Island, of the Beaver Group, is about 13 miles long north and south, and its width is $3\frac{1}{4}$ miles at the north end, gradually increasing to a maximum of $6\frac{1}{2}$ miles near the south end. The island is wooded and bordered by bluffs on the west side and is lower on the east side. In general it is skirted by shallow water from 880 yards to 1 mile offshore, but deep water approaches close to in Sandy Bay, about the middle of the east side.

Several reefs lying $1\frac{1}{2}$ miles east and 1,320 yards northeast of the northeast point of the island, and having depths of 13 to 15 feet, limit to that extent the draft in the passage between the banks extending, respectively, from the northeast point of Beaver Island and from the south end of Garden Island.

Light.—A fixed and flashing white light, 103 feet above water, visible fixed 18, flashing 19 miles, is shown from a yellow cylindrical tower attached to a dwelling on the bluff at the south end of Beaver Island.

Fog signal.—The fog signal is made on a steam whistle.

Buoy.—A black spar buoy marks the northern edge of the shoal making out from the northeast point of Beaver Island.

Beaver Harbor, situated near the northeast point of Beaver Island and facing eastward, affords shelter from all except southeast winds. The southerly end of the harbor is very shoal, with only 4 to 6 feet of water, and the draft in the northerly portion is limited to about 8 feet. There is, however, deep water reaching into the bay and extending across the middle in a northwesterly direction from the entrance to the docks at St. James on the west side, with width of 300 to 335 yards.

Directions.—Vessels must be careful to avoid the shoal on the north side of the entrance, extending about 200 yards southerly from the shore abreast the light. With the light ahead, bearing northwest by north, distant 1 mile, open the light a little on the starboard bow, heading about west-northwest, which will lead into

the harbor. Pass the lighthouse, giving it a berth of 200 yards. Good anchorage can be found on a line between the inner and outer docks.

Light.—A fixed red light, 38 feet above water, visible 10 miles, is shown from a white cylindrical tower on the north side of the harbor entrance.

Shoal.—Shoal water extends nearly 1 mile southeasterly from Stony Point, at the south side of the entrance to Beaver Harbor. A detached soft shoal with 15 feet of water on it lies $2\frac{1}{4}$ miles 115° (SE. by E. $\frac{1}{2}$ E.) from the light.

Buoy.—A black spar buoy marks the outer end of the shoal water extending southeast from Stony Point.

Coast Guard and storm-warning stations.—There is a Coast Guard station just west of Beaver Harbor Lighthouse. Day and night storm-warning signals are displayed from a steel tower on Church Hill, 1 mile south of St. James.

High Island, about $3\frac{1}{4}$ miles west of the north end of Beaver Island, is $3\frac{1}{4}$ miles long north and south and is $2\frac{1}{4}$ miles wide at the north end, decreasing to $1\frac{1}{4}$ miles at the south end. There are some hills on its west side and near the northeast corner and a scattering of woods over the island. Shoals reach out 1 mile from the west shore and from 880 to 1,320 yards around the south end and the east shore, except at the northerly end of the latter, where deep water sets in close to the land just under the narrow point extending to the eastward at the northeast end of the island. From this point shallow water extends northward a distance of $1\frac{1}{4}$ miles and 1,320 yards farther eastward than the extremity of the point.

Trout Island is situated $1\frac{1}{8}$ miles north of the northwest corner of High Island, on a bank which almost connects with the shallow water reaching northerly from High Island. Its greatest extent is about 1,100 yards northwest and southeast, and its width about 660 yards. Shoal water extends off about 440 yards on the north, increasing to 880 yards on the east and west sides. Southwesterly from the island 1,540 yards to 1 mile are detached spots with 16 feet least water. Trout Island Shoal, $1\frac{1}{8}$ miles in a 275° (W. $\frac{1}{2}$ N.) direction from the island, is a hard shoal with 15 feet least depth, extending about 1,540 yards north and south with 18 feet or less depth.

Gull Island is $6\frac{1}{2}$ miles west of the south end of High Island, is $1\frac{1}{4}$ miles long north and south by about 220 yards greatest width, is somewhat wooded, and has low, bluff shores. The surrounding water is generally shallow for 880 yards out, and from the southerly end a bank extends to the southeast 1 mile, and from the northerly end 1,320 yards north by east.

Gull Island Reef lies 4 miles south-southeast from the south end of Gull Island and has least depth of 4 feet, hard and stony bottom.

Within the 24-foot curve this shoal is about $2\frac{1}{2}$ miles long north and south and about 1 mile in greatest width near its northerly end, narrowing considerably to the southward. Soundings of 12 to 15 feet are found well over the entire area.

Richards Reef, located about 8 miles 259° (W. $\frac{1}{4}$ S.) from Beaver Island Light, has $23\frac{1}{2}$ feet least water on it, and this only on one spot.

Buoy.—A red spar buoy marks the $23\frac{1}{2}$ -foot spot on Richards Reef.

Boulder Reef, having least depth of 16 feet and of small extent, is located about 20 miles 272° (W. $\frac{1}{4}$ N.) from Beaver Island Light and about 4 miles north of the 267° (W. $\frac{1}{4}$ S.) course from abreast of this light to Poverty Island Passage.

Light and whistle buoy.—A red and black cylindrical buoy, showing an occulting white light, is moored in 33 feet about 440 yards south of the shoalest part of the reef.

Fog signal.—The fog signal is made on a bell sounded by the action of the waves.

Little Traverse Bay may be considered as having Seven-mile Point as its north entrance point and Nine-mile Point as its south entrance point. From a line joining these points the bay is about 10 miles deep. It is wide, has deep water and good holding ground, and affords protection from all but westerly winds.

There is a shoal 880 yards in extent in the northeast corner of the head of the bay and one in the southeast corner extending 660 yards offshore; with these exceptions the shores are steep-to.

Harbor Springs.—From Seven-mile Point the coast curves to the southward and eastward to Harbor Springs on the northern shore of Little Traverse Bay and is shoal for 660 yards offshore. This harbor, although limited in area, is one of the finest natural harbors of refuge on the lake, affording security in any weather. Wharves extend out to 10 or 12 feet of water. Lumber and farm products are the industries. The population is about 1,800.

Little Traverse Bay Light, fixed red, 41 feet above water, visible 10 miles, is shown from a red, square tower attached to a dwelling on Harbor Point, north side of Little Traverse Bay.

Fog signal.—The fog signal is made on a bell.

Storm-warning station.—Day and night signals are displayed from a steel tower at the foot of Spring Street.

Petoskey.—A village on the south shore of Little Traverse Bay, near its inner end has a population of 5,064 (1920); it has manufacturing of lime, lumber, flour, and paper; it is also a watering place.

The harbor facilities consist of a private wharf projecting about 750 feet beyond the shore line protected on the west by a breakwater.

The harbor is difficult of entrance for large vessels and for small vessels during stormy weather.

Breakwater.—The length of the breakwater from the shore line is 448 yards, consisting of 148 yards of stonework at the shore end and 300 yards of cribwork; the distance from the outer end of the landing pier is 163 yards. A length of the timber superstructure, about 20 yards from the outer end of the breakwater, was damaged several years ago and is badly in need of repairs.

Light.—A flashing red light, 34 feet above water, visible 7 miles, is shown from a white, octagonal tower on a pyramidal base, on the north end of west breakwater on the south side of Little Traverse Bay.

Depths.—The depth of water near the outer end of the breakwater is about 28 feet, decreasing gradually to about 14 feet at the end of the landing pier, and thence shoaling to the shore line.

Anchorage.—The anchorage ground is bad, being stony, and the only mooring facilities are at the one landing pier belonging to the Michigan Transit Co. There are no rules concerning mooring vessels to the breakwater.

Charlevoix lies about 7 miles southwestward of Nine-mile Point, at the mouth of the Pine River, between Grand and Little Traverse Bays. Population about 2,250. The lower channel of Pine River leads to Round Lake, which is really the harbor-proper of Charlevoix, and thence through the upper channel to Pine Lake.

Round Lake is about 660 yards in diameter with depths of over 60 feet.

Pine Lake is about 14 miles long and about 1 to 2 miles wide and is navigable to its upper end for vessels drawing 12 feet, in the lower end there are depths of over 60 feet. Near the northwestern end an arm of the lake extends southward 8 miles to the village of East Jordan, to which a depth of 12 feet can be carried.

Entrance piers.—The entrance from Lake Michigan is protected by two piers and revetments, the north pier is 575 yards and the south pier 677 yards long; the clear width between the piers at the entrance is 160 feet and at the narrowest part about 100 feet.

Lights.—An occulting white light, 61 feet above water, visible 12 miles, is shown from a white, pyramidal skeleton tower near the outer end of the north pier.

A fixed red light, 37 feet above water, visible 10 miles, is shown from a red, square open frame tower near the end of the south pier.

Fog signal.—The fog signal is made on a bell.

Upper channel.—The revetment on the north side of the upper channel is 113 yards and on the south side 122 yards long with a width between them of 83 feet.

Depths.—Outside and opposite the middle of the entrance 15 feet existed in September, 1920, and the same depth for a width of 80 feet at outer ends of the piers and for a width of 40 feet farther inside to Round Lake. The upper channel has a depth of 15 feet for a width of 60 feet.

Directions.—From the outer ends of the piers a course 119° (SE. by E. $\frac{3}{4}$ E.) for 650 feet leads in the axis of the channel, then 108° (ESE. $\frac{3}{4}$ E.) for 850 feet, then 95° (E. $\frac{1}{2}$ S.) for 500 feet, then approximately 114° (SE. by E. $\frac{3}{4}$ E.) through Round Lake, then about 108° (ESE. $\frac{3}{4}$ E.) through the upper channel and into Pine Lake.

The lower channel from Lake Michigan to Round Lake is 667 yards long and is easily navigated.

The upper channel from Round Lake to Pine Lake is 500 yards long.

The channel in Pine Lake extends to Boyne City with a least depth of 12 feet near Boyne City. About 6 miles from its west end an arm of Pine Lake extends southward 8 miles to the village of East Jordan and South Arm, to which 12 feet can be carried.

Bridges.—The lower channel near its upper end is crossed by highway drawbridge with a clear width in the south opening of $71\frac{1}{2}$ feet, the north opening being inaccessible.

The upper channel near its upper end is crossed by the Pere Marquette Railroad drawbridge with a clear width in the south opening of 84 feet. The north opening is inaccessible.

Bridge signals.—The signal for opening the draws are three short blasts, on a whistle or horn.

Bridge lights.—Both bridges have a red light at each end of south abutment and at each end and center of draw rest; also 3 compound red and green lights on the top of the draw spans (at center and each end) showing red up and down stream when bridge is closed and green when open.

Mariners should obtain copies of the Rules and Regulations governing vessels, in force at each port and comply with same.

Coast Guard station is located on the south side of the harbor entrance.

Storm warnings.—Day and night signals are displayed from a steel tower on the bluff about 250 feet east of the Coast Guard station and 100 feet south of the channel.

Coast.—From Charlevoix the coast trends southwesterly for nearly $1\frac{1}{4}$ miles, then northwesterly about 1,320 yards to South Point, and may be approached within 440 yards.

Buoy.—A black spar buoy marks the extremity of the shoal water extending northward from South Point.

Fisherman Island is situated about $3\frac{1}{2}$ miles southwest of South Point and 660 yards offshore on a rocky bank reaching over 1 mile northwesterly from the mainland, with only 8 to 10 feet of water on its outer edge. It forms the northeast entrance point of Grand Traverse Bay.

Buoy.—A black spar buoy marks the outer edge of this shoal.

Grand Traverse Bay extends southerly from Lake Michigan about 32 miles, is about 10 miles wide, and is separated from the lake to the west by the Leelanau Peninsula. Its head is divided into the East and West Arms by a narrow peninsula extending northerly about 17 miles and terminating in Old Mission Point. The shores of the bay are generally hilly and wooded.

General directions.—Grand Traverse Bay can everywhere be safely navigated if a vessel keeps 1 mile offshore, excepting in rounding Old Mission Point, when the lighthouse should be given a berth of 2 miles; it may be approached somewhat closer if bound down the East Arm.

East Arm—East shore.—From Fisherman Island to the head of East Arm the shore is unsafe to approach within 1 mile on account of many rocky spots and ledges and numerous spits extending from the shore. The head of East Arm is filled by a shallow flat extending $1\frac{1}{4}$ miles from the south shore.

Elks Rapids.—A village on the eastern shore of East Arm of Grand Traverse Bay, at the mouth of the Elk River. It has a population of about 1,300, and has iron and cement works, etc., and is on the line of the Pere Marquette Railroad.

West shore.—From the head of East Arm the shore trends northeasterly to Old Mission Harbor; from the head of the bay for $2\frac{1}{4}$ miles northward the coast should be given a berth of 880 yards and on to Old Mission Harbor a berth of 440 yards.

Old Mission Harbor affords good shelter against all winds from east through north to southwest, its northeasterly shore is deep-to, and shallow water extends from 335 to 500 yards off the opposite shore. From the point inclosing it on the north a shoal spit extends 660 yards southeastward.

Old Mission Point.—From Old Mission Harbor the shore trends slightly northwestward for about $2\frac{1}{4}$ miles to Old Mission Point, which forms the extremity of the peninsula separating East and West Arms. This part of the coast may be approached within 440 yards, but shoal water extends north and west from Old Mission Point, making it inadvisable to approach nearer than 2 miles on the northern and western sides.

Light.—A fixed white light, 43 feet above water, visible 13 miles, is shown from a white, square tower on a dwelling located on Old Mission Point.

Bell buoy.—A red and black horizontally striped bell buoy is moored in 24 feet on the northerly edge of the shoals off Old Mission Point.

West Arm—East shore.—From Old Mission Point the coast trends in a general southwesterly direction for about 8 miles to Tucker Point. A dangerous rocky flat extends $1\frac{1}{2}$ miles from the shore between Old Mission and Merrill Points and has depths of 7 to 13 feet near the outer edge. Between Merrill and Tucker Points, the offshore bank makes it advisable to give the shore a berth of at least 1,100 yards.

Tucker Point forms the western entrance point to Bowers Harbor. A shoal with 4 feet over it extends southward 880 yards from Tucker Point.

Buoy.—A black spar buoy moored in 22 feet marks the outer limit of the shoal off Tucker Point.

Bowers Harbor, inside of Tucker Point, is sheltered from all but southwesterly winds and affords good and secure anchorage. The shore is clear and may be approached to within 440 yards.

Marion Island, west of Bowers Harbor and south of Tucker Point, is little over 1 mile long and 1,320 yards wide. It is entirely surrounded by shoal water, a rocky spit extending 1,320 yards to the southwestward, with 8 feet on its southern edge, and a smaller spit for nearly the same distance from its northeastern edge, with a rocky spot showing above water. The island must not be approached close-to.

Buoys.—A red spar buoy marks the extremity of the spit extending from the northern end of the island. A red and black, horizontally striped, spar buoy marks the extremity of the spit extending from the southern end of the island.

Coast.—From Bowers Harbor the coast trends slightly southwestward to the head of the bay; it is clear and may be approached to within 440 yards.

Traverse City is the principal harbor on Grand Traverse Bay, and there is good anchorage off the town. The harbor fronts on the open bay and is fully exposed to northerly winds. There are several wharves in good condition and with depth of 13 feet or more at the outer ends, including the Hannah & Lay Co.'s lumber and coal wharf near the foot of Union Street, the Michigan Transit Co.'s wharf about 260 feet east of the preceding, and the Oval Wood Dish Co.'s wharf about 850 feet east of Boardman River entrance.

It is a manufacturing town with a population of 10,925 (1920).

Storm-warning station.—Day signals are displayed from a flagstaff on the State Bank Building.

Boardman River, flowing out of Boardman Lake at Traverse City, is navigable to the dam of the Hannah & Lay flour mill, just

above the upper crossing of Union Street, for $3\frac{1}{2}$ -foot draft at ordinary stages, and for about half this distance for 4 to $4\frac{1}{2}$ foot draft. The current is swift. Sheet-pile piers, constructed by the city, restrict the channel so that the current maintains the depth by scour; a sand bar forms about 100 feet out, but has at least 4 feet of water on it.

Light.—A fixed white light, 20 feet above water, visible 10 miles, is shown from a post with a cross arm located on the pier at the mouth of the river.

Bridges across the river below the dam have clear channel-span dimensions as follows: Grand Rapids & Indiana Railway bridge, near the mouth, width $26\frac{1}{2}$ feet, height 10 feet; footbridge at foot of Wellington Street, width 14 feet, height 9 feet; highway bridge at foot of Park Street, width 42 feet, height 6 feet; highway bridge near foot of Union Street, width 53 feet, height 9 feet; Front Street highway bridge, arch span of 50 feet, 9 feet high at center. The Union Street upper highway bridge is just below the dam, and there are other bridges above the dam thence to Boardman Lake.

City regulations affecting navigation may be obtained from the local authorities, and should be carefully observed.

West shore.—From Traverse City the coast trends westerly, then northerly to Norrisville. Shoal water extends 660 yards from the shore except at Norrisville, where a shoal with only 5 feet on its outer edge extends 1,100 yards to the eastward.

Buoy.—A red spar buoy marks the outer extremity of the shoal extending eastward from Norrisville.

From Norrisville the coast trends in a general northerly direction for 9 miles turning abruptly to the east to Lee Point. Shoal water extends 660 yards offshore along this part of the coast, except southward from Lee Point a shoal extends 1,320 yards.

A shoal patch, with 20 feet on it, lies $1\frac{1}{2}$ miles southward of Lee Point.

Light and bell buoy.—A conical buoy, showing an occulting white light, 11 feet above the water, visible 9 miles, is moored in 22 feet northeastward of Lee Point to mark the outer edge of the bank extending from it.

Fog signal.—A bell is sounded by the action of the waves.

The coast from Lee Point trends northward for about 5 miles to Sutton Point; it should be given a berth of 880 yards.

Sutton Point forms the eastern entrance point to Sutton Bay. Shoal water extends 880 yards northward of it.

Buoy.—A black spar buoy moored in 22 feet marks the outer extremity of the shoal.

Sutton Bay, open to the northeast, inside of Sutton Point, at the west entrance to West Arm of Grand Traverse Bay. It affords

good anchorage and is well protected, except from northeasterly winds. The western shore of Sutton Bay is shallow for 880 yards; the south and east shores may be approached within 440 yards.

New Mission Bay, behind New Mission Point, has good water, with secure anchorage and shelter from all winds from east through north to southwest. The coast from New Mission Bay to Sutton Bay is deep-to.

New Mission Point forms the eastern side of New Mission Bay and the southern entrance point of Northport Bay. Shoal water extends about 440 yards from it.

Northport Bay is an indentation between New Mission Point and Northport Point and affords shelter from all except southeasterly winds. The shores of the bay are generally deep close-to, but there are two dangerous shoals with 3 and 5 feet least depths lying about the middle of the bay between Northport Point and the town of Northport on the west shore. The larger shoal is 1,540 yards long, with its south end 1,100 yards west of Northport Point; the other spot is about 1,100 yards farther west. A spit extends 880 yards north from the south point of Northport Bay. Bellow Island, lying $2\frac{3}{4}$ miles south by west from Northport Point, is small and has shoal water for 440 yards off its north and east sides. Depths of 3 fathoms or less exist 1 mile north of the island and also 440 yards southeast of it.

Storm-warning station.—Day signals are displayed from a steel tower at the main dock at Northport.

Northport Point forms the northern side of that bay. Shoal water extends 500 yards southeasterly from the point.

Light and bell buoy.—A red conical buoy, showing an occulting white light, is moored in 30 feet to mark the outer end of the shoal extending southeastward from Northport Point.

Fog signal.—The fog signal is made on a bell sounded by the action of the waves.

Coast.—From Northport Point the coast trends northward and eastward to Light House Point. It can be safely approached to within 880 yards except for a spit extending from a point 1,320 yards north of Northport Point.

Light House Point forms the northern extremity of the Leelanau Peninsula and the western entrance point of Grand Traverse Bay. A rocky spit extends 880 yards to the northward from it. The point should be given a berth of 1 mile.

Grand Traverse Light, fixed white, 47 feet above water, visible 14 miles, is shown from a yellow, square tower on a dwelling on Light House Point, west side of entrance to Grand Traverse Bay.

Fog signal.—The fog signal is made on a steam whistle.

Fox Islands.—South Fox Island is 17 miles north-northeastward from North Manitou Island (later described) and 18 miles north-west of Light House Point, and North Fox is about 4 miles northeasterly of South Fox. The holding ground around the Foxes is very good and they afford shelter from all winds except from the north-west and southeast.

North Fox Island is wooded, is 2 miles long north and south and 1 mile wide at its north end, tapering to a point at the south end, which is hilly. It can be approached to within 440 yards on its north and east sides, but on its west side near the south end shallow water with depths of 6 to 15 feet extends off 1,540 yards, and a spit extends 880 yards south from the south point.

South Fox Island, the larger of the two, running in a north-northwesterly and south-southeasterly direction, is 5 miles long by about $1\frac{1}{2}$ miles greatest width, diminishing to a point at either end. It is hilly on the westerly side, but lower and wooded on the east side. Around its northwesterly end shoals extend off 880 yards, and from the extreme northwest point a spit with depths of 11 to 15 feet reaches to the northwest $1\frac{1}{2}$ miles. A detached 15-foot shoal is located about 1,100 yards off the westerly shore and $1\frac{1}{4}$ miles northwest from South Fox Island Light on the south point of the island.

Light.—A fixed and flashing red light, 67 feet above water, visible 16 miles, is shown from a white square tower attached to a dwelling on the southern end of South Fox Island.

Fog signal.—The fog signal is made on a steam whistle.

This light serves as a guide through the channel between South Fox and North Manitou Islands.

Light buoy.—A black conical buoy, showing an occulting white light, 10 feet above water, visible 9 miles, is moored in 26 feet about 2 miles south by east from the light on the southern extremity of South Fox Island.

Buoy.—A black spar buoy is moored alongside the light buoy.

This light buoy marks the southern side of the passage immediately southward of South Fox Island.

South Fox Island Shoals form an extensive bank reaching over 9 miles south from South Fox Island, having general depths of 3 to 6 fathoms, but with least depths on shoal spots as follows:

A 10-foot spot lies $4\frac{1}{4}$ miles south by west from South Fox Island Light; the bottom near the buoy is rocky, the soundings irregular, and deeply laden vessels should navigate carefully in this vicinity in thick or foggy weather.

Buoy.—A red and black horizontally striped nun buoy is moored close south of it.

A 9-foot spot lies $7\frac{1}{4}$ miles about south by west from the light-house; other shoals with 13 or 14 feet are found for 1 mile north

of the can buoy, and $1\frac{1}{2}$ miles south of it there are spots with 18 to 20 feet depth.

Buoy.—A red and black can buoy is moored close south of it.

A shoal group lies $9\frac{1}{4}$ miles south of South Fox Island Light.

Buoy.—A red nun buoy is moored in deep water off the southern extremity of the shoal group.

Cat Head Bay, about 3 miles southwest of Light House Point, affords good shelter in southerly winds; two spits extend about 1,320 yards from the shore between Light House Point and the bay.

A spit having a least depth of 15 feet on its western outer edge extends about 1 mile northward from the southern shore of the bay.

Cat Head Point is the western entrance point to Cat Head Bay; approaching it from the southwest, a clump of trees on the extremity of the point gives it the appearance of an island. A detached shoal with $18\frac{1}{2}$ feet on it lies about 1,100 yards northward of the point. A shoal with 12 feet on it lies on the edge of the bank extending 1,320 yards northwesterly from the point.

Coast.—From Cat Head Point the coast trends in a general southwesterly direction for about 15 miles to Carp River Point. With the exception of the shoal lying northeastward of Leland (described later) this part of the coast is clear of any offlying danger and may be approached to within 1,320 yards.

Carp (Leelanau) River is a narrow and crooked stream about 1,335 yards long, flowing out of Leelanau Lake and emptying into Lake Michigan about $1\frac{1}{4}$ miles northeastward of Carp River Point. About 100 yards above its mouth, at Lake Michigan, it is obstructed by a concrete dam with a 9-foot head; the short stretch below the dam has a depth of 2 to 4 feet, with banks about 40 feet apart and partly revetted with slabs and piles, forming a harbor for small fishing boats. In 1909 there was no provision for passing boats by the dam, but the owner of the dam contemplated building an electrical tramway to care for vessels with beam not exceeding 14 feet. Above the dam and about 250 feet east of it, the river is crossed by the Leland highway bridge, at Main Street; this is a 100-foot steel truss with headroom of about $5\frac{1}{2}$ feet. From this bridge to Leelanau Lake the river is navigable for vessels of shallow draft.

Leelanau Lake is about 16 miles long and its width varies from about 200 feet to $1\frac{1}{4}$ miles. The upper and lower portions have depths of from 30 to 60 feet, but in the narrows near Provemont only 6 feet draft is available. A steel bridge with headroom of about 15 feet crosses the lake at Provemont. The lake is considered a navigable waterway of the United States.

Leland is about 13 miles southwestward of Cat Head Point, at the mouth of the Carp River. In calm weather, vessels can lie at a bridge pier built on piles.

Light.—A fixed red light, 16 feet above the water, visible 4 miles, is shown from a white post located on the north end of the pier at the entrance to Carp Lake. This light is privately maintained.

Shoals.—Detached shoals, with 8 to 14 feet over them, lie $3\frac{1}{4}$ miles north-northeastward from the pier.

Good Harbor Bay, an indentation lying southward of Carp River Point, has good water close in to the shore; North Unity Dock on its westerly shore affords good protection in all winds except from the north and northeast. The northeasterly portion of this bay, however, is obstructed by an extensive rocky shoal area with detached spots, having depths varying from 14 to 17 feet and lying between west-southwest and southwest by south from Carp River Point, the nearest spot being 2 miles therefrom and the farthest $3\frac{1}{4}$ miles. The most northerly spot, with 5 feet of water on it, is close south of a line joining Carp River Point and Pyramid Point, $2\frac{1}{4}$ miles from the former; the shoal nearest the mainland is $1\frac{1}{8}$ miles from the shore of Good Harbor Bay about $2\frac{1}{4}$ miles south of Carp River Point.

Pyramid Point forms the western entrance point to Good Harbor Bay and is bluff. There is very good holding ground under it.

Pyramid Point Shoals, with least depths of 7 to 13 feet, lie north and northeasterly of Pyramid Point within 2 miles. A detached shoal with 20 feet on it lies northward of the group.

Buoy.—A black can buoy marks the northerly end of these shoals.

Manitou Islands and Passage.—The two Manitou Islands lie about $6\frac{1}{4}$ miles north-northwesterly from the main shore at Sleeping Bear and Pyramid Points. Between the islands and the mainland is Manitou Passage, used by large vessels proceeding to and from the south end of Lake Michigan. An ample width of deep water will be found by giving the shoals off Pyramid Point a good berth and passing to southward of the aids marking the shoal area south of North Manitou Island. The islands are about $3\frac{1}{4}$ miles apart northeast and southwest, with deep water between them.

South Manitou Island, the smaller of the two, $3\frac{1}{4}$ miles long north and south by $3\frac{1}{4}$ miles greatest width east and west, is hilly and bluff on the west side and lower and wooded on the east side. All its shores are deep close to except the southerly, from which shoals extend 1,320 yards; a detached 18-foot spot lies $1\frac{1}{8}$ miles southerly from the most southerly point of the island.

South Manitou Harbor, in the east side of the island and semi-circular in shape, is protected from all winds from northeast through west to southwest and has deep water with good holding ground.

Light.—A fixed white light, 104 feet above water, visible 19 miles, is shown from a white conical tower on the southeast point of South Manitou Island.

This light serves as a guide into South Manitou Harbor and through Manitou Passage.

Fog signal.—The fog signal is made on a steam whistle.

Coast Guard and storm warning stations.—There is a Coast Guard station on the south side of South Manitou Harbor. Day and night storm-warning signals are displayed from a steel tower on the Coast Guard station grounds. The island has telephone connection with Glen Haven on the mainland.

North Manitou Island is 7 miles in length north and south by about $4\frac{1}{2}$ miles in width east and west at the north end and about 2 miles at the south end; in general it is hilly and wooded. A lee can be found under North Manitou, with generally good holding ground. The bight on the east side affords good shelter from westerly winds; depth 14 to 20 fathoms. The north shore is deep-to, the east shore clear to within 660 yards, and the west shore to within 880 yards. Shoals with 6 to 18 feet depths extend off $1\frac{1}{2}$ miles around the most southerly point of the island, and thence to the most easterly point of the south shore of the island; shoals with 12 to 16 feet are found 2 miles southerly from shore.

Light.—An alternating flashing red and white light, 70 feet above water, visible 16 miles, is shown from a white, square pyramidal tower located on the southeast point of North Manitou Island.

In the winter a flashing white light, visible 12 miles, is exhibited.

Fog signal.—The fog signal is made on a steam whistle.

North Manitou Island Shoals.—In addition to the shoal spots off the south side of the island, an area of foul ground with limiting depths of 3 to 5 fathoms extends southerly for $3\frac{1}{2}$ miles from the most southerly point and 3 miles from the lighthouse point.

Buoy.—A red nun buoy marks the southwestern end of these shoals.

North Manitou Shoal Light Vessel shows a fixed white light, 30 feet above water, visible 12 miles. It has a white hull, black oval daymark at the foremast head, *Manitou* on both sides and is anchored in 21 feet at the southeastern end of the shoals in about Lat. $45^{\circ} 01' N.$, Long. $85^{\circ} 57' W.$

Fog signal.—The fog signal is made on a steam whistle.

Submarine bell.—There is a submarine bell on the light vessel.

Coast Guard and storm warning stations.—There is a Coast Guard station a short distance south of Pickards Wharf, North Manitou, post office, on the east side of the island toward the northerly end. Day and night storm-warning signals are displayed from a steel tower on the Coast Guard reservation.

Sleeping Bear Bay is an indentation in the coast southward of Pyramid Point and eastward of Sleeping Bear Point. It affords

good shelter from all winds from west through south to northeast. Just northward of the bay a rock spit with 6 feet on it extends 1,100 yards offshore and a shoal extends nearly 880 yards for 1 mile south of the spit.

Glen Arbor.—At Glen Arbor, on the southeasterly shore of Sleeping Bear Bay, there is a depth of 11 to 12 feet at the landing, which is a private pile pier about 400 feet long.

Glen Haven.—At Glen Haven, on the westerly shore of Sleeping Bear Bay, there is a depth of 11 feet at Days Dock, and day and night storm-warning signals are displayed from a steel tower on the outer end of the dock.

Sleeping Bear Point is the western entrance point to the bay and is bordered by high bluffs.

Shoals.—A shoal composed of boulders with $17\frac{1}{2}$ feet least depth on it lies 1 mile offshore west of Sleeping Bear Point.

Light buoy.—A black cylindrical buoy, showing a flashing white is moored in 34 feet on the western edge of the shoal. A black spar buoy is moored alongside.

Vessels using Manitou Passage should keep to westward of the buoy.

A Coast Guard station is located at Sleeping Bear Point, about $1\frac{1}{2}$ miles northwesterly of Glen Haven.

Empire Bay is a bight of navigable water about 10 miles across and with but little indention, formed by Empire Bluffs as a southern limit and by shoals jutting out in a westerly direction from Sleeping Bear Point as a northern limit. The shore is bold, bordered by high bluffs, and may be approached to within 660 yards. At Empire, a village near the northerly end of Empire Bluffs, two bridge piers, built by local enterprise, extend into Lake Michigan about 500 feet and 450 feet, respectively, and serve for shipment of freight.

Sleeping Bear Hill, a prominent landmark, is about $2\frac{1}{2}$ miles south of Sleeping Bear Point and $5\frac{1}{2}$ miles north of Empire Bluffs.

Platte Bay.—From Empire Bay the coast trends southerly for about 4 miles then westerly for about 3 miles to Platte River Point, forming a bight called Platte Bay. The shore of this bay is bordered by high bluffs, is bold, and may be approached within 660 yards except at Platte River Point.

Platte River empties into Lake Michigan at Platte River Point. A rocky shoal extending $1\frac{1}{2}$ miles northward from the point has a depth of 3 feet at 1,320 yards and about 12 feet near the outer end.

Betsie Point.—From Platte River Point the coast trends southwesterly for about $5\frac{3}{4}$ miles to Betsie Point. This part of the shore is bold, bordered by high bluffs, and may be approached within 660 yards.

Light.—A flashing white light, 52 feet above water, visible 15 miles, is shown from a cylindrical tower on Betsie Point.

Fog signal.—The fog signal is made on a chime air whistle.

Coast Guard station is located about 220 yards south of the light-house.

Frankfort Harbor.—The coast from Point Betsie trends southward for $4\frac{1}{2}$ miles to Frankfort Harbor and is clear of outlying obstructions. The shore near the harbor is bluff, with maximum height above the lake of 325 feet.

The harbor is formed by Lake Betsie (Aux Becs Scies), which is connected with Lake Michigan by a channel protected by piers and revetments.

Lake Betsie (Aux Becs Scies).—It is about $1\frac{1}{2}$ miles long and 335 to 667 yards wide. It is generally shoal, but affords a depth of about 20 feet in the lower portion. There is no basin at this harbor other than that afforded by Lake Betsie and no bridges to obstruct navigation.

Channel.—The channel between Lake Michigan and the harbor (Lake Betsie) is straight and easily navigated; its direction is nearly east and west. It is sometimes obstructed at the entrance by a shoal which is constantly reformed after dredging and which usually obstructs the northern half of the channel at its outer end. In July, 1920, there was a depth of 18 feet for a width of 200 feet in the channel.

Piers and revetments.—There are two piers, with the outer ends opposite each other, 218 to 195 feet apart in the clear. The total length of the north pier and revetment is 667 yards, and the pier projects 335 yards beyond the shore line. The south pier and revetment have a total length of 676 yards; the pier projects about 530 yards beyond the shore line. The piers and revetments are parallel, except for a length of about 200 feet at the inner ends.

Lights.—A flashing red light, 35 feet above water, visible 6 miles, is shown from a red, pyramidal structure on the outer end of South Pier.

Range lights—Front light.—A fixed white light, 46 feet above water, visible 14 miles, is shown from a white, square, pyramidal structure located on the outer end of North Pier.

Fog signal.—The fog signal is made on an air diaphone. If the diaphone is not functioning it will be made on a siren.

Bear light.—A fixed white light, 66 feet above water, visible 15 miles, is shown from a white post 200 yards 96° (E. $\frac{1}{2}$ S.) from the front light.

This range shows the direction of the harbor entrance.

Coast guard station is located on south side of the harbor entrance.

Storm warnings.—Day and night signals are displayed from a steel tower at the Coast Guard station.

Radio station is operated all the year by the United States Navy; call letters NSR; working distance 150 miles.

Betsie River is a small shallow stream flowing into the head of Lake Betsie (Frankfort Harbor). It is crossed near its mouth by a highway bridge with clear span of 18 feet between piles and height of 3.7 feet, and by the Ann Arbor Railroad Bridge with clear span of 18 feet and headroom of 5.2 feet.

Arcadia Harbor.—From Frankfort the coast curves into the eastward to Herring Lake, about 5 miles southward of Frankfort, and then trends slightly to the westward for about 5 miles to Arcadia Harbor. There are no outlying obstructions, and it may be approached within 440 yards.

North Bar Lake is a body of water 1,600 yards long north and south, with an extreme width of about 1,135 yards in the southern part. From the north end about 1,000 yards of the length of the lake is from 100 to 260 yards wide and 18 to 36 feet deep, with the 18-foot curve following very close to the shore line. This part of the lake is parallel to the shore line of Lake Michigan and separated from it by a narrow strip of land from 100 to 250 yards wide. The larger, southern portion has depths of 14 feet and upward in its western section adjacent to the entrance, and shoals off into a marsh at the east end, where it receives its only stream (Bar Creek).

The village, having a population of about 400, is situated at the north end of the deep, narrow portion of the lake.

Channel.—North Bar Lake is connected with Lake Michigan by a dredged channel about 465 yards long, protected by piers. The width between piers is 163 feet at the inner ends and 200 feet at the outer ends of the north pier.

A report that in May, 1916, there was an available depth of about 10 feet in the channel is the latest information available. No dredging is contemplated, as the harbor is not being maintained.

Piers.—The north pier, 360 yards long, projects about 180 yards beyond the shore line; the south pier, 445 yards long, projects about 145 yards beyond the shore line and about 105 yards farther west than the north pier. The outer 245 yards of the north pier and the outer 150 yards of the south pier are in fair condition. The inner 120 yards of the north pier and the inner 280 yards of the south pier are in bad condition.

Portage Lake Harbor.—The coast from Arcadia to Portage Lake Entrance, 8½ miles, presents no obstacle to safe navigation and

can be approached within 440 yards. It is marked by many high hills and is wooded.

Portage Lake is about $3\frac{1}{2}$ miles long and from $\frac{1}{2}$ to $1\frac{1}{2}$ miles wide. It has depths of 4 to 8 fathoms. The anchorage is good, but the mooring facilities are limited, although the Michigan Transit and the Pere Marquette docks at Onekama afford fair accommodations for moderate-sized boats. There are no bridges. The harbor is of no importance owing to the limited use made of it. It is not recommended for further maintenance.

Channel.—The channel from lake to lake is about 765 yards long and bears nearly east and west. The channel now existing can not be regarded as stable, and would require frequent dredging to remove the sand swept in by the shore currents, especially on the bar in Lake Michigan, at the entrance.

The last soundings showed available depths of about 12.6 feet on the south half of the entrance bar in Lake Michigan and 17.8 feet on the north half of the bar and 16 feet or more between the piers. A vessel with a draft of 13 feet 8 inches reported touching bottom in mid-channel at the entrance to the piers in May, 1919.

Piers.—The total length of the north pier and revetment, including a wing 38 yards long at the inner end, is 735 yards, and the pier projects about 375 yards beyond the shore line. The total length of the south pier and revetment, including a wing 17 feet long at the inner end, is 765 yards, and the pier projects about 370 yards beyond the shore line. The clear width between the piers at the entrance is 120 yards, narrowing to 118 yards inside.

Light.—A flashing white light, 38 feet above water, visible 11 miles, is shown from a white, square, pyramidal tower on the outer end of the north pier.

Onekama, a village of about 300 inhabitants, is located at the inner end of Portage Lake on the north side. It has several lumber mills and there are mineral springs close by.

Manistee Harbor.—From Portage Lake the coast trends south-southeast for $8\frac{1}{2}$ miles to Manistee. It is somewhat bluff generally 60 feet in height with a few hills 115 to 180 feet high. The maximum extent of shoal water from the coast is 880 yards.

The harbor comprises Manistee Lake and Manistee River flowing out of this lake. The mouth of the river, which forms the entrance, is protected by piers and revetments.

Channel.—The channel has a length of $1\frac{1}{2}$ miles from Lake Michigan to Manistee Lake. Its direction at the entrance between the piers is about east-southeast, and then it follows the river course easterly. The interior channel between the piers and in the river is in frequent need of dredging to remove the material washed in from the unpro-

tected banks; except at the bridges, the best water is usually in the middle of the channel.

In August, 1920, there was a depth of 20 feet on the entrance bar in Lake Michigan, 18 feet in the basin inside the breakwaters and in the channel between the piers. In the Manistee River from the inner end of the north revetment to Manistee Lake there is a depth of 17½ feet. The channel is 90 feet wide, except in the bend at the west end where it varies from 250 feet to 90 feet, and at and between the bridges where the width varies with the width of the draw openings, increasing to 126 feet between the two upper bridges.

Breakwater.—South breakwater, of stone-filled timber cribs, extends 435 yards southeasterly from its outer end, which is located 135 yards south of a point in the prolongation of the north pier and 200 yards beyond the outer end of the latter. The connecting structure extends about 400 yards southeastward from the inner end of the breakwater to the shore; at the inner or shore end there is a wing wall 46 feet long.

Light.—A flashing red light, 45 feet above water, visible 8 miles is shown from a red skeleton tower on the outer end of the breakwater.

Range lights—Front light.—A fixed white light, 33 feet above water, visible 12 miles, is shown from a white tower attached to fog signal house, on the outer end of the north pier.

Fog signal.—The fog signal is made on a steam whistle.

Rear Light.—A fixed white light with a red flash, 45 feet above water, visible 13 miles, is shown from a white, square tower attached to a dwelling on the north side of the Manistee River 660 yards 112° 45' (ESE. ¼ E.) from the front light. (See Light List.) These lights form a range for approaching the harbor.

Piers and Revetments.—The total length of the north pier and revetment is 970 yards, of which 44 feet at the outer end has been wrecked; a length of 275 yards at the inner end is occupied by the Manistee & Northeastern Railroad, under permit from the Secretary of War, and is all in bad condition. At the inner end of the north revetment, the railroad company built an extension about 184 feet long, which also is in bad condition. The total length of the south pier and revetment is now 335 yards. The north pier projects 420 yards beyond the short line and about 235 yards beyond the end of the south pier, which projects 115 yards beyond the short line. The width between the pier is 178 feet at the entrance, narrowing to 150 feet inside. The banks of the river above the piers are only partly protected by revetments, generally in poor condition, the width between the latter, where they exist, being 135 feet or more.

Manistee Lake is about 4 miles long, 440 to 880 yards wide, and has a depth of 40 feet. Anchoring facilities are poor; mooring facilities are good.

Town.—The city of Manistee is situated on Manistee Lake and on Manistee River. It had a population of 9,694 (1920), and is on the line of several railroads. It has machine shops, boiler works, lumber mills, and a fruit-raising industry.

Coast Guard Station is located on the north side of the harbor entrance.

Storm warnings.—Day and night signals are displayed from a steel tower at the Coast Guard station.

Big Manistee River enters Manistee Lake at its north end. It is crossed by a number of fixed bridges. A dam is located at a point about 20 miles east of Manistee.

Bridges across Manistee River from mouth to Manistee Lake.

No.	Location and name.	Kind.	Miles from west end of north pier.	Draw openings—clear width.			Clear height above low-water datum.	Remarks.
				Right. ¹	Left. ¹	Center.		
				<i>Fect.</i>	<i>Fect.</i>	<i>Fect.</i>	<i>Fect.</i>	
1	Maple Street.....	Highway	1.1	.....	.....	71.3	21	2-leaf bascule. See Note 1.
2	Smith Street.....	do.....	1.4	59.4	59.2	.....	29.3	Swing. See Note 2.
3	Manistee & NE. R. R.	Railway	1.5	56.1	57.1	.....	13.7	Do.

¹ Looking downstream.

Whistle signal for opening draws: 2 long, 1 short (——— ———). Bells on bridges are sounded before opening draws.

NOTE 1.—Red light above tender's cabin south of south abutment; 2 red lights on each abutment; a compound red-and-green lights on each leaf at the opening, show red up and down stream when bridge is closed and green when open.

NOTE 2.—Red light at each end and on each side of draw rest; 2 red lights on each abutment; 3 compound red-and-green lights on top of draw span (at center and each end) show red up and down stream when bridge is closed and green when open.

City regulations affecting navigation should be procured from the local authorities and carefully followed.

Big Sable Point.—From Manistee the coast trends in a southwest by south direction for 16 miles to Big Sable Point. It is bluff with a few hills and deep water at 660 yards off shore. The point has hills rising inland but a lower shore line.

Light.—A fixed white light, 106 feet above water, visible 19 miles, is shown from a conical, white and black, tower connected to a dwelling on Big Sable Point.

Fog signal.—The fog signal is made on an air siren.

Coast Guard station.—A Coast Guard station is located 1 mile south of the lighthouse.

Storm warnings.—Day and night storm warning signals are displayed from a steel tower at the Coast Guard station.

depths of 1 or 2 feet and is crossed by a small wooden highway bridge.

Piers and revetments.—The total length of the north pier and revetment is 742 yards, extending from Pentwater Lake to Lake Michigan. The total length of the south pier and revetment is 615 yards. From the inner end of the Government revetment to Pentwater Lake the south bank of the channel is occupied by a dilapidated pile revetment belonging to the Pere Marquette Railroad Company. The north pier projects 182 yards beyond the shore line and 50 yards beyond the end of the south pier, which projects 210 yards beyond the shore line. The outer end of the north pier for a length of 40 yards is badly wrecked, and very little of it remains. The clear width between the piers at the entrance is 51 yards, narrowing to 45 yards at the inner end.

Range lights—Front Light.—A fixed red light, 25 feet above water, visible 4 miles, is shown from a red post on the outer end of the south pier.

Rear Light.—A flashing red light 108 feet above water, visible 19 miles, is shown from a red, square pyramidal tower 22 yards $113^{\circ} 10'$ (ESE. $\frac{1}{4}$ E.) from the front light.

These lights in range indicate the direction of the harbor entrance.

Channel.—The channel from lake to lake bears 113° (ESE. $\frac{1}{4}$ E.). Its ordinary depth is from 9 to 10 feet. The Interior portion of the channel is fairly stable, but the required depth at the outer end and across the bar in front of the entrance could be maintained only by frequent dredging.

Soundings completed in April, 1919, showed available depths of 7 feet on the north half and 8 feet on the south half of the entrance bar in Lake Michigan and 10 feet in the channel between the piers. No dredging has been done since 1916.

A ferry cable crosses the channel near the inner end of the piers. Signal for lowering cable 3 blasts (— — —).

Pentwater.—The town of Pentwater is situated on the northern shore of Pentwater Lake, near the outlet to Lake Michigan, and has a population of about 1,200. A large fruit-canning industry is carried on here.

Coast Guard station is located on the north side of the harbor entrance.

Storm warnings.—Day and night signals are displayed from a steel tower on the Coast Guard reservation.

Little Sable Point.—From Pentwater the coast, which is very regular, trends in a general southwest by south direction for 10 miles to Little Sable Point, in an almost continuous line of bluffs.

It is clear of offlying dangers and can be approached within 880 yards.

The point is from its rounding appearance interior hills and lake (Little Sable) somewhat similar to Big Sable Point. The hills are not so high, the highest being 153 and 173 feet.

Light.—A fixed and flashing white light, 108 feet above water, visible 19 miles, is shown from a white, conical tower connected to a red dwelling on Little Sable Point.

As seen from the lake, the tower and dwelling are projected against a background of sand hills partially covered with light timber.

Coast.—From Little Sable Point the coast, which is very regular, trends in a general south-southeast direction for 20 miles to White Lake Harbor. It is quite rugged, but has no shoal beyond 880 yards offshore. Clay banks, 245 feet high, are $10\frac{1}{2}$ miles from Little Sable Point; there are many other hills and bluffs along this part of the coast having a height of 125 to 225 feet.

Benona Harbor (Stony Lake).—Benona is at the foot of Stony Lake, $6\frac{1}{2}$ miles southeast of Little Sable Light and about $13\frac{1}{2}$ miles north of White Lake Harbor. Stony Lake is about 2,700 yards long and from 300 to 600 yards wide, with depths of from 15 to 50 feet, the 15-foot curve being within about 100 feet of the shore line, except at the extreme east end where the lake becomes shoaler. Stony Creek, a shallow stream about 30 to 40 feet wide, enters the lake at the extreme northeast corner and leaves at the northwest corner. The overland distance in a straight line from Stony Lake to Lake Michigan is about 1,100 yards; by the creek channel the distance is about 1,530 yards. At the mouth of Stony Creek some rows of old piles extend into Lake Michigan.

White Lake Harbor, Mich.—This improvement gives access from Lake Michigan to White Lake, which is the harbor for the towns of Montague and Whitehall, at its head. The entrance channel is artificial.

White Lake forms the harbor basin. The lake is about 5 miles long, from 440 yards to $1\frac{1}{4}$ miles wide, and has depths of 25 to 70 feet. Anchorage is good, but mooring facilities exist only at Whitehall near the head of the lake, where there are several docks with accommodations for large steamers as well as a number of smaller docks, and at two resort docks at the westerly end of the lake.

Piers and revetments.—The length of the north pier and revetment is 570 yards, and of the south pier and revetment 651 yards. The north pier projects 192 yards and the south pier 235 yards beyond the shore line and 57 yards beyond the end of north pier. These piers are practically parallel, and the width between them is 62 yards at the entrance, increasing to 69 yards at the Coast Guard station. Both of the interior revetments have been in a ruinous condition for a number of years.

Lights.—A fixed red light, 33 feet above water, visible 9 miles, is shown from a red, square, pyramidal tower on the outer end of the south pier.

An occulting white light, 57 feet above water, visible 15 miles, is shown from a yellow, octagonal tower attached to a dwelling on the south bank of the entrance to the harbor.

Entrance channel.—The channel between the piers is about 650 yards long and bears nearly east and west. The existing channel is fairly stable at its inner end, but a shoal which repeatedly forms near the outer end and in the lake outside the entrance requires annual dredging.

In June, 1920, there was a depth of 15.4 feet on the northern half and 16.6 feet on the southern half of the entrance bar in Lake Michigan and 14 feet for a width of 80 feet in the channel between the piers.

Directions.—Immediately after leaving the entrance channel, the line of best water in White Lake trends to the south around a shoal projecting from the northern shore.

Towns.—The towns of Montague and Whitehall are located on the northern and southern shores, respectively, of the harbor at its head.

A Coast Guard station is located near the inner end of the north pier.

White River—Bridges.—There is a sand bar in the head of White Lake at the river mouth, on which the depth is only $1\frac{1}{2}$ feet. The highway drawbridge on road from Whitehall to Montague has clear width of 36 feet in each span, clear height of 6.8 feet, and 4 to 7 feet of water under it; the railing and planking are spiked so that bridge can not be opened. The Pere Marquette Railway bridge, about 450 feet farther up, has four fixed spans and a draw span; the draw is at the north end, its north half swinging over land and its south opening having clear width of 32 feet and clear height of 3.8 to 5.3 feet; the ends of the rails are fastened so that the draw can not readily be opened; the fixed span south of the draw has clear height of $6\frac{1}{2}$ feet and clear width of 17 feet; depth under bridge, 2 to 6 feet. There are no lights at either bridge.

Muskegon Harbor.—The shore line of Lake Michigan continues in a south-southeast direction from White Lake $11\frac{1}{4}$ miles to Muskegon Harbor and consists of low bluffs and some hills; it is clear of shallow water to within 1,100 yards. Duck Lake is situated about $2\frac{1}{4}$ miles southeast of the White Lake entrance piers.

Before emptying into Lake Michigan Muskegon River, one of the largest in Michigan, expands into Muskegon Lake. The river below Muskegon Lake and the lake itself form the harbor of Muskegon. The lake has a length of about 5 miles and width of from 1 to 2 miles, and general depths of from 30 to 40 feet, reaching a maximum

of 73 feet, with 12 to 18 feet at the heads of the landing piers at the city of Muskegon. A shoal bank extends nearly 1,320 yards from the north shore. A pile of submerged rocks about 25 feet in diameter lie 95 feet northwest of Bank Point Light. The anchorage is good; wharves can be found only at Muskegon.

Buoy.—A black spar buoy marks the pile of submerged rocks.

Piers and revetments.—The north pier and revetment have a total length of about 1,750 yards. The total length of the south pier and revetment is 1,570 yards, excluding the part owned by the Pere Marquette Railroad Co. The north pier projects about 502 yards beyond the shore line, and the south pier about 503 yards beyond the shore line and about 57 yards beyond the north pier. The clear width between the piers is 103 yards at the entrance and 100 yards farther inside.

A length of about 650 feet of the south revetment is controlled by the Pere Marquette Railroad and was formerly used in connection with its translake car ferries, but it has been abandoned and is in bad condition, being breached in places.

Lights.—A flashing white light, 41 feet above water, visible 10 miles, is shown from a white skeleton tower on the outer end of the north pier.

A fixed red light, 21 feet above water, visible 6 miles, is shown from the inner end of the south pier.

A flashing red light, 24 feet above water, visible 6 miles, is shown from a black, square, pyramidal tower in 9 feet of water on point of the shoal extending from the north shore of Muskegon Lake.

This light marks the turning point in the lake.

Range lights—Front light.—A fixed red light, 31 feet above the water, visible 9 miles, is shown from the gable end of the fog-signal building on the outer end of the south pier.

Fog signal.—The fog signal is made on a steam whistle.

Rear Light.—A fixed red light, 50 feet above water, visible 14 miles, is shown from a red, conical tower 331 yards 60° (NE. by E. $\frac{1}{2}$ E.) from the front light.

These lights form a range showing the direction of the entrance.

Entrance channel.—The channel from lake to lake is about 1,785 yards long, its bearing at the entrance and for the greater part of its length being northeast by east, deflecting to east-northeast at the inner end. A bar frequently forms outside of the entrance, obstructing the northern approach, but the southern approach has usually retained a good depth. Annual dredging on the bar is required for maintenance.

In June, 1920, there was a depth of 20 feet on the entrance bar in Lake Michigan and in the 300-foot channel from Lake Michigan to Muskegon Lake.

Directions.—Vessels bound to Muskegon should steer 96° (E. $\frac{3}{4}$ S.) on leaving the cut and pass to the southward of the light beacon on Bank Point, then haul up to 54° (NE. $\frac{1}{4}$ E.) until abreast of the docks.

City.—The city of Muskegon is located on the southeastern shore of Muskegon Lake. It has many varied and important industries such as foundries, machine shops, sawmills, tinplate works, piano and furniture manufactories.

The population is 36,570 (1920).

Coast Guard station is located on the south side at the harbor entrance.

Storm warnings.—Day and night signals are displayed from a steel tower at the Coast Guard station.

Muskegon River, above Muskegon Lake, has a length of about 33 miles to Newaygo, which may be called the head of navigation. For a distance of about 24 miles below Newaygo the average width is about 230 feet, with depths varying from 3½ to 9 feet at a stage of about 2 feet above extreme low water. For the remaining 9 miles the main branch of the river varies in width from about 80 to 230 feet, averaging about 130 feet, and is from 2½ to 9 feet deep at a stage of about 2 feet above extreme low water.

The old main south channel at Muskegon, over which the drawbridges are located, was practically dry for several years. Dredging by local interests has restored a navigable channel for about 1 mile. The drawbridges are again in operation. The old main north channel and the Cedar Creek Channel are each navigable for the small boats which are able to pass under the bridges.

Bridges across Muskegon River at Muskegon.

No.	Location and name.	Kind.	Miles from mouth, shore line.	Draw or span openings—clear width.			Clear height above low water.	Remarks.
				Right. ¹	Left. ¹	Center.		
OLD MAIN SOUTH CHANNEL.								
				Feet.	Feet.	Feet.	Feet.	
1	PereMarquetteRy	Railway.	5.5			30	4	Swing, 1 span.
2	Bank Street.....	Highway	5.5	38	38	-----	3.8	Swing.
3	County line.....	do.....	17.5	102	158	102	13	Fixed truss, 3 spans.
4	Bridgeton.....	do.....	23.5	80	80	78.78	12	Fixed truss, 4 spans.
5	Newaygo.....	do.....	37.2	147	147	-----	18	Fixed truss, 2 spans.
OLD MAIN NORTH CHANNEL.								
6	PereMarquetteRy.	Railway	5.5	14	14	26	4.3	Fixed plate girder and trestle.
7	Bank Street.....	Highway	5.5	15.5	15.5	40	3.2	Fixed truss and trestle.
8	Footbridge.....	-----	5.5	25	25	25	5.2	Fixed trestle.
CEDAR CREEK CHANNEL.								
9	North Muskegon..	Highway	5.5	-----	-----	-----	4.5	Concrete trestle, 34 spans, each 16 feet clear width.
10	PereMarquetteRy.	Railway	5.9	-----	-----	41.5	5.7	Fixed plate girder and trestle.

¹ Looking downstream.

² Opening not available for use

No lights are maintained on the bridges.

Coast.—From Muskegon the coast trends south-southeast for 12 miles to Grand Haven with deep water at 880 yards. The first $4\frac{1}{2}$ miles is backed by a range of hills which attain a maximum elevation of 205 feet; the remainder of the stretch of coast is lower.

Lake Harbor, Mich., a small body of water $4\frac{1}{2}$ miles south of Muskegon piers, is the location of several summer resorts and cottages and is used by small pleasure craft. It is $3\frac{1}{2}$ miles long east and west, from 142 to 1,100 yards wide, and generally 18 to 40 feet deep. At the western end is an outlet into Lake Michigan through a slightly winding channel 685 yards long, and from 50 to 85 feet wide; the entrance is at times practically closed by drifting sand, with depths inside of 3 to 6 feet to the bridge. The north pier is almost entirely washed away, and the south pier is gone except for a double row of piles extending from a point 50 feet out in the lake to a point 115 yards inside. The banks rise steeply from each shore.

A steel girder highway bridge crosses the entrance, having a draw span 80 feet long over all; the north draw is over the channel, with clear width of 29 feet and clear height of 10.7 feet. There are mooring facilities for launches on both sides of the bridge. A trestle bridge crosses the lake $1\frac{1}{2}$ miles farther east, with a draw near the north shore.

Grand Haven Harbor is on the Grand River and, like all harbors on the eastern shore, it is connected with Lake Michigan by a dredged channel protected by piers and revetments.

Piers and revetments.—The total length of the north pier and revetment is 1,140 yards; a pile revetment 50 yards long connects the inner end with the north shore. The total length of the south pier and revetment is 1,925 yards, of which the inner 75 yards above the southerly side of Howard Street is no longer maintained by the United States, being along private property and a street end. The north pier projects about 532 yards, and the south pier about 588 yards beyond the shore line. The clear width between the piers is 138 yards at the entrance, diminishing to 130 yards inside. Opposite Grand Haven the north bank of the river is not protected, and the distance between it and the south revetment diminishes to 113 yards in the narrowest place. Vessels are not permitted to moor to the inner part of the Government pier on the south side of the channel.

Channel.—The channel between the piers bears nearly east by north for 750 yards, then nearly northeast by east toward Grand Haven. A shifting bar frequently forms immediately outside the piers, requiring removal by dredging. The inner portions of the existing channel are fairly stable in character. No basin exists at this harbor. The channel opposite Grand Haven is used for winding, the least width of 15 feet depth being about 300 feet, in front of the Grand Trunk Railway and Goodrich Docks.

In November, 1920, there was a depth of 18 feet on the entrance bar in Lake Michigan and in the channel between the piers westward of the United States Coast Guard station.

Light.—A flashing white light, 30 feet above water, visible 8 miles, is shown from a white skeleton pyramidal tower on the outer end of the north pier.

Range lights.—**Front light.**—A fixed red light, 36 feet above the water, visible 9 miles, is shown from the gable end of a fog signal building located on the outer end of the south pier.

Fog signal.—The fog signal is made on an air siren.

Rear.—A fixed and flashing red light, 52 feet above water, visible 15 miles, is shown from a red cylindrical tower, 200 yards 80° (ENE. $\frac{1}{2}$ E.) from the front light.

A Coast Guard station is located on the north side of the harbor entrance.

Storm warnings.—Day and night signals are displayed from a steel tower on the Cutler Block, southwest corner of Third and Washington Streets, $1\frac{1}{2}$ miles from the pier entrance and 467 yards from the docks.

Radio station.—A radio station is operated all the year by the United States Navy; after close of navigation station is not open from 8 p. m. to 8 a. m.; call letters NSY; working distance 150 miles.

Bridges.—There are no bridges across the harbor at Grand Haven.

There is a highway bridge over the narrow cut-off channel on the north of Grand Haven, about 100 feet above the head of the Grand Trunk car-ferry slip, with clear width of draw opening of 42 feet and height of 7.2 feet.

Spring Lake.—About 2 miles above the harbor is Spring Lake, connected with Grand River at Ferrysburg by a narrow channel 14 feet deep. This lake is about $4\frac{1}{2}$ miles long and 233 to 667 yards wide, with general depths of from 20 to 40 feet, reducing at the head to about 10 feet at the dock at Fruitport.

Bridges across outlet of Spring Lake.

No.	Location and name.	Kind.	Distance above Grand River.	Draw openings—clear width.		Clear height above low-water datum.	Remarks.
				Right. ¹	Left. ¹		
1	Spring Lake-Ferrysburg...	Highway....	Feet. 800	Feet. 52	Feet. 52	Feet. 5.7	Swing. See Note 1.
2	Grand Trunk Ry.....	Railway....	1,000	.....	62	6.6	Swing. See Note 2.

¹ Looking downstream.

Whistle signal for opening draws: 4 blasts (— — — —). See regulations under "Grand River."

NOTE 1. Red light at each end of center pier and on east side of opening; 3 compound red-and-green lights on top of draw (at center and each end) show red up and down stream when bridge is closed and green when open.

A new bridge, parallel to old and about 40 feet downstream, is being built; when completed, old bridge will be removed.

NOTE 2.—Red light on piling on east side of opening; red light shows in center when open; 2 red and green lights on draw (at each end) show red up and down stream when bridge is closed and green when open.

Grand River (below Grand Rapids).—Grand River is navigable from its mouth at Grand Haven to Grand Rapids, a distance of 39 miles. Its natural width varies from 100 to 334 yards.

Channel.—Training walls are all located in the upper 23 miles, between the mouth of Bass River and Grand Rapids. The tops of the walls were from 1 to 2 feet above low water of 1889 and narrowed the available width to from 53 to 60 yards. The channel of best water between these training walls varies in width from 40 to 100 feet.

From Grand Rapids to the mouth of Bass River the depths in the river are not now being maintained; no survey has been made since 1910, when the depths were from 4 to 6 feet, referred to low water of 1889, and it is believed that no more than 3 feet at extreme low water would be found at this time. From the mouth of Bass River to Grand Haven, a distance of 15 miles, there is a depth of 6 feet on four short bars in this part of the river.

Bridges across Grand River, Grand Haven to Grand Rapids.

No.	Location and name.	Kind.	Miles above mouth, west end north pier.	Draw openings—clear width.		Clear height above low water.	Remarks.
				Right. ¹	Left. ¹		
				<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	
1	Grand Trunk Ry.....	Railway.....	2.8	66	65	8.7	Swing. See Note 1.
2	Grand Haven-Spring Lake.	Highway.....	3	61	61	6.2	Swing. See Note 2.
3	Eastmanville.....	do.....	19.4	64.6	* 70.6	21	Swing. No lights.
4	New York Central R. R....	Railway.....	37.2	54	.....	17	Do.
5	Michigan Ry. (electric)....	do.....	39.5	* 70	70	27	Do.
6	Wealthy Street.....	Highway.....	39.8	70	.....	19.3	Do.
7	Pere Marquette Ry.....	Railway.....	39.9	70	.....	19.2	Do.

¹ Looking downstream.

* Opening not available for use.

Whistle signals for opening draws: No. 1, 1 blast (—); No. 2, 2 blasts (— —); all others, 3 blasts (— — —).

NOTE 1.—Red light on each end of center pier, on each end of draw pier, and on fender piles at each end of north side of north draw opening; three compound red-and-green lights on draw span (at center and each end) show red up and down stream when bridge is closed and green when open.

NOTE 2.—Red light on each of four ice breakers on upstream side of bridge and on each of two pile clusters and on draw rest on downstream side of bridge; three compound red-and-green lights on top of draw span (at center and each end) show red up and down stream when bridge is closed and green when open.

Regulations to govern the opening of drawbridges across Grand River and the channel at mouth of Spring Lake, Mich., prescribed by the Secretary of War, February 2, 1910.

THE REGULATIONS.

In conformity with the foregoing, the following rules and regulations are prescribed to govern the opening of the drawbridges across Grand River, Mich., and across the channel at mouth of Spring Lake, Mich.

1. The following is the number of blasts of a whistle or horn, which shall be given as a signal for opening the corresponding bridges:

Detroit, Grand Haven & Milwaukee Railway bridge across Grand River, 1 blast (—).

Grand Haven-Spring Lake highway bridge across Grand River, 2 blasts (— —).

The highway bridge and the railway bridge (two bridges) across channel at mouth of Spring Lake, 4 blasts (— — — —).

All other bridges across Grand River, 3 blasts (— — —).

2. When at any time during the day or night, a vessel, tug, or any boat unable to pass under the bridge approaches it for the purpose of passing through the draw, and the signal prescribed above is given, the draw spans of the bridge shall be opened forthwith for the prompt passage of said vessel or craft, unless there is a train, wagon, or other vehicle actually on the bridge at the time, in which case the draw spans shall be opened immediately after the said train, wagon, or other vehicle shall have passed out of the way: *Provided*, That when the signal is given on the craft not more than 5 minutes before a time at which the bridge tender has information that a train will arrive, the opening of the draw may be delayed until immediately after the passage of that train; but in no case shall there be longer delay than 10 minutes in opening the draw.

3. These rules and regulations will take effect and be in force from and after February 15, 1910.

Holland (Black Lake) Harbor.—From Grand Haven the coast trends southward and slightly to the eastward for 20 miles to Holland Harbor. It is somewhat bold, wooded, and has a number of hills 140 to 200 feet high. The shore is clear of off-lying dangers and can be approached within 880 yards.

This harbor consists of Black Lake and the channel leading to Lake Michigan. In May, 1920, the entrance channel had a depth of 16 feet.

Black Lake extends from the entrance channel about 5 miles to the city of Holland, at its head; its general width is from 332 to 1,000 yards. The channel in Black Lake is narrow in places, but with depths of 18 feet or more except in the vicinity of the docks at Holland, where the prevailing depths are about 10 feet. Mooring facilities exist at Holland at a few pierheads on the south side of the lake, and at the wharf at Ottawa Beach and the wharf at Jenison Park, both owned by the Michigan Railroad Company. The anchorage is relatively good. There are no bridges in the harbor.

Lights.—A fixed white light, 15 feet above water, is shown from a lantern on house on piles on the southeast point of Middle Ground Shoal.

A fixed red light, 16 feet above water, is shown from a lantern on house on piles, on the point of Drake Point Shoal.

A fixed white light, 17 feet above water, is shown from a lantern on a house on piles, off Superior Point.

Outer converging piers.—The outer converging piers are 100 yards apart at their outer ends and 245 yards apart at their inner ends. The north pier has a length of 251 yards and the south pier a length of 267 yards. The pile structures connecting the inner ends of the outer piers with the outer ends of the old interior piers are 95 yards long on the north side and 91 yards long on the south side. The distance from the outer entrance to the west end of the inner piers is 283 yards, and to the shore line about 353 yards on the north side and 433 yards on the south side.

Inner piers and revetments.—The total length of the inner north pier and revetment is about 603 yards. The total length of the inner south pier and revetment is 546 yards. The width between these piers is 68 yards at the entrance, diminishing to 54 yards 165 yards inside, when it is 65 to 68 yards to the angle and 53 yards thence to Black Lake.

Entrance channel.—The channel between the inner piers is 600 yards long, with an angle between the two lakes; it extends nearly east and west 400 yards and then about east-southeast for 200 yards to Black Lake. The Lake Michigan shore line is advancing steadily and a shoal is now apt to form at the entrance to these piers. Dredging on the outer bar and between the outer and inner piers is required annually.

In May, 1920, there was depths of 16 feet for width of about 250 feet at the entrance, 700 feet at the inner end of the entrance channel, and 100 feet in the river to Black Lake.

Range lights.—Front light.—A flashing red light, 30 feet above water, visible 7 miles, is shown from a red oval tower on the outer end of the south breakwater.

Rear light.—A fixed red light, 45 feet above water, visible 10 miles, is shown from a red square pyramidal tower 295 yards 86° (E. $\frac{1}{2}$ N.) from the front light.

These lights form a range showing the direction for entering the harbor.

Fog signal.—The fog signal is made on a steam whistle.

Coast Guard station is located at Macatawa Park, south side of the harbor entrance.

Storm warnings.—Day and night signals are displayed from a steel tower at the coast guard station.

Black River—Bridges.—In the main (short) channel, Black River has a depth of 3 feet or more to the Pere Marquette Railroad

bridge, a distance of about $1\frac{1}{2}$ miles. The highway bridge about 900 feet upstream from Black Lake, is a fixed span with clear width of 105 feet and clear height of 7.8 feet; no lights. The Pere Marquette Railroad bridge, about 1.3 miles up the main channel from the highway bridge, has two fixed spans with clear width of about 25 yards each and clear height of about 8 feet.

Saugatuck Harbor.—From Holland the coast trends southward and slightly to westward for $7\frac{1}{2}$ miles to Saugatuck Harbor. It is bordered by low bluffs and occasional hills from 100 to 250 feet in height and has deep water within 880 yards.

Saugatuck, the port of shipment pertaining to this harbor, is on Kalamazoo River and Lake, about 2 miles above the present entrance.

Piers and revetments.—The north pier and revetment have a length of about 914 yards and the wing at the east end is about 35 feet long. The south pier and revetment have a length of about 827 yards and the wing at the east end is about 34 feet long. The north pier projects about 312 yards and the south pier about 340 yards beyond the shore line, their outer ends being opposite each other. The width between the piers and revetments is 200 feet.

Channel.—The channel between the piers is about 832 yards long and bears east by south. Thence the bending river channel extends about 1.7 miles in a general southerly direction to Saugatuck.

There was a depth of 16 feet on the entrance bar in Lake Michigan in May, 1916, and in the channel between the piers. In April, 1916, there was an available depth of 14 feet in the river to Saugatuck. The effect of dredging on the bar and between the piers is very temporary, as shoals again appear after the first storms.

Lights.—A flashing red light, 31 feet above water, visible 7 miles, is shown from a red, square column on the outer end of south pier.

Kalamazoo River above Saugatuck.—At Saugatuck the Kalamazoo River expands into Kalamazoo Lake; as a result of dredging a narrow channel with a depth of 14 feet was produced across the lake to the Crawford Dock at Douglas. From Saugatuck to New Richmond, about 8.7 miles above, the river has a width of from 100 to 150 feet and affords, at low water, a narrow and crooked channel for boats drawing not more than 3 feet. The river is navigable in a limited way for a further distance of 38 miles to Allegan, the channel being narrow and much obstructed by fallen trees and snags, and having a depth of less than 3 feet at low water.

Bridges across Kalamazoo River from mouth to New Richmond.

No.	Location and name.	Kind.	Miles above west end north pier.	Draw openings—clear width		Clear height above low water.	Remarks.
				Right. ¹	Left. ¹		
1	Saugatuck-Douglas.....	Highway....	2.5	<i>Fect.</i> 64	<i>Fect.</i> 59.6	<i>Fect.</i> 5.5	Swing. See Note 1. Swing. No lights. See Note 2.
2	Pere Marquette Ry.....	Railway....	11	40	30	18	
3	New Richmond.....	Highway....	11.1	30	30	18	

¹ Looking downstream.² Opening not available for use.

NOTE 1.—Signal for opening draw, three short blasts (— — —) ; answered by bell on bridge.

White light on each abutment ; red-and-white light at center of bridge shows red up and down stream when bridge is closed and white when open.

NOTE 2.—Owing to the peculiar arrangement of the guard piers of bridges 2 and 3, the width available for vessels is restricted to 25 feet.

Regulation for opening draw of Highway Bridge connecting the villages of Douglas and Saugatuck, over the Kalamazoo River, Mich., prescribed by the Secretary of War, August 25, 1908:

THE REGULATIONS.

In conformity with the foregoing, the following rules and regulations are prescribed to govern the opening of said drawbridge:

1. When at any time during day or night a vessel, tug, or any boat unable to pass under the bridge approaches it for the purpose of passing through the draw, the signal for the draw to be opened shall be three blasts (— — —) of a whistle or horn blown on the craft, and when such signal is given the draw span of the bridge shall be opened forthwith for the prompt passage of said vessel or craft, unless a wagon or other vehicle is actually on the bridge at the time, in which case the draw span shall be opened immediately after said wagon or vehicle shall have passed out of the way: *Provided*, That in no case, except some unavoidable accident on the bridge or its mechanism, shall there be a longer delay than 10 minutes in opening the draw.

2. If the bridge is ready to open immediately when the signal is given on the craft, the signal shall be answered by three blasts (— — —) of a horn or three taps of a bell; and if the draw is not ready to be opened immediately on the signal being given on the craft, the answering signal shall be two blasts (— —) of a horn or two taps of a bell.

3. These rules and regulations will take effect and be in force from and after September 1, 1908.

Coast.—From Saugatuck the coast trends south by west for 19 miles to South Haven. The offshore water is free from dangers; the land consists mostly of clay bluffs.

South Haven Harbor is at the mouth of Black River, which flows into Lake Michigan through a channel protected by piers and revetments. The city of South Haven is situated upon both banks of the river.

Piers and revetments.—The entrance channel is protected by parallel piers and revetments 55 to 63 yards apart. The length of the north pier and revetment is 714 yards and of the south pier and revetment 727 yards. The north pier projects about 433 yards and the south pier 342 yards beyond the shore line.

Channel and basin.—The channel between the piers and revetments has a length of about 730 yards and bears approximately east by north; the channel in the river above, to the highway bridge, has a length of 867 yards. The channel between the piers and in the river requires dredging for maintenance.

The river from the Government revetments to the winding basin, which is about 167 yards below the bridge, is 67 yards wide; the basin has an extreme width of 100 yards. There is no anchorage and only such mooring facilities as are furnished by private docks.

In September, 1920, the controlling depth was 20 feet on the entrance bar in Lake Michigan, 17.2 feet in the channel between the piers, and 16.2 feet in the river.

Black River is navigable for small craft for some distance above the bridge.

Range lights—Front light.—A fixed red light, 37 feet above the water, visible 10 miles, is shown from a red conical tower located on the pier 10 yards from the outer end.

Rear light.—A fixed red light, 52 feet above the water, visible 15 miles, is shown from a red skeleton tower located 267 yards 81° (E. by N.) from the front light.

These lights in range indicate the direction for entering the harbor.

Fog signal.—The fog signal is made on a bell located at the front lighthouse.

A Coast Guard station is located on the south side of the harbor entrance, near the shore line.

Storm warnings.—Day and night signals are displayed from a steel tower on the lighthouse reservation, south side of the channel, near the coast-guard station.

Bridge.—The highway bridge at Dyckman Avenue has a clear width of 40 feet in the east (or left) draw opening and 57.9 feet in the west (or right) draw opening, and clear height of 8.6 feet. The left opening is available only for small craft. Three compound red-and-green lights, one in the center and one on each end of the draw span, show red when bridge is closed and green when open. Whistle signal for opening, 3 long blasts (——— ——— ———); a bell on the bridge sounds return signal.

Local regulations affecting navigation, enforced by the city of South Haven, may be had from the local authorities. Every mariner should obtain a copy of these regulations and comply with them.

Coast.—From South Haven, the coast trends southwestward for 22 miles to St. Joseph Harbor. It is skirted by low bluffs nearly all the way, and is clear of shoals beyond the 660-yard limit offshore.

St. Joseph Harbor.—At the mouth of St. Joseph River, which flows along the city front of St. Joseph between docks and revetments, and empties into Lake Michigan through a channel protected by piers and revetments. At the upper end the harbor connects with the Benton Harbor Canal, which extends to the city of Benton Harbor.

Piers and revetments.—The total length of the north pier and revetment at the entrance channel is 951 yards; at the east end a pile wing, originally 55 yards long, connected it with the dock of the United States Lighthouse Depot; but the southerly half has been removed to give access to the Coast Guard Boathouse. The pier projects about 658 yards beyond the shore line and 70 yards beyond the end of the south pier. The total length of the south pier is 868 yards, and it projects 657 yards beyond the shore line. The width between the piers is 108 yards in the outer section, narrowing to 83 yards inside.

Entrance Channel—Inner Harbor—Benton Harbor Canal.—The total length of channel from the entrance to the upper end of the Benton Harbor Canal is about 2.1 miles. The entrance channel bears approximately eastsoutheast for 600 yards; thence southeast by east for 350 yards to the inner end of the piers; thence east by south to the Pere Marquette Railway Bridge. The channel of best water passes through the north draw openings of the two bridges.

The inner harbor is 100 yards wide at its narrowest part and has a length of 1,167 yards from the inner end of the entrance piers to the mouth of the Benton Harbor Canal. The Benton Harbor Canal is about 98 feet wide in its narrowest part and 1,567 yards in length. The harbor has been dredged repeatedly to the projected dimensions, but shoals are liable to be formed in the Benton Harbor Canal in consequence of the defective condition or absence of revetments, and at and below the mouths of the Paw Paw and St. Joseph Rivers through the accretions of mud and sand brought down by those rivers during floods.

In June, 1920, there was a depth of 18 feet in the entrance channel, and in the 150-foot channel in the St. Joseph River, and 15 feet in the 100-foot channel to Benton Harbor.

Basins.—At the winding basin at the upper end of the harbor the St. Joseph River enters the harbor channel. The winding basin at

the upper end of the Benton Harbor Canal has a greatest width of 83 yards and depth of about 14 feet; the width of the entrance is 37 yards. The basins afford no room for anchorage and only such facilities for mooring as are provided by the owners of private docks.

Light.—An occulting red light, 53 feet above water, visible 10 miles, is shown from a red skeleton tower on the outer end of the south pier.

Range lights—Front light.—A fixed white light, 31 feet above water, visible 12 miles, is shown from a white, cylindrical tower on the outer end of the North Pier.

Bear light.—A fixed white light, 53 feet above water, visible 15 miles, is shown from a white octagonal tower attached to a fog-signal building, 105 yards 108° (ESE. $\frac{1}{2}$ E.) from the front light.

Fog signal.—The fog signal is made on a steam whistle.

These lights form a range showing the direction for entering the harbor.

A Coast Guard station is located near the inner end of the North Pier.

Storm warnings.—Day and night signals are displayed from a steel tower on the bluff in Lake Front Park.

Dry dock.—The Twin City Shipbuilding Co., Benton Harbor, has a floating dock made from the hull of an old freight boat, which will accommodate tugs and small steamers up to about 120 feet length, 24 feet width, and 9 feet draft.

Morrison Channel.—This channel is a branch or arm of the St. Joseph River about 1,750 yards long, from 23 to 53 yards wide, and with least depth of about 4 feet in the middle of the channel. Its north end joins the harbor on the south side about 400 yards below the upper end of the harbor and its south or upper end connects with the river.

Paw Paw River.—This river, emptying into the Benton Harbor Canal about 500 feet above the mouth of the latter, is navigable for small craft in a tortuous channel to above the upper Pere Marquette Railroad Bridge. Its length from the upper Pere Marquette Railroad Bridge to the mouth is about 2.6 miles; its width within this reach varies from 22 to 63 yards, and the least depth in the channel of best water is about 3 feet.

Bridges across St. Joseph Harbor, Benton Harbor Canal, Morrison Channel and Paw Paw River.

No.	Location and name.	Kind.	Miles from west end of north pier.	Draw openings—clear width.			Clear height above low-water datum.	Remarks.
				Right. ¹	Left. ¹	Center.		
ST. JOSEPH HARBOR.								
1	Pere Marquette Ry...	Railway...	0.7	<i>Feet.</i> 100	<i>Feet.</i> 91	<i>Feet.</i>	<i>Feet.</i> 11.4	Swing. See Note 1.
2	State Street.....	Highway...	.8	100	97	.....	14.1	Do.
BENTON HARBOR CANAL.								
3	Territorial Street.....	Highway...	2.1	.....	70	.....	5.6	Swing. No lights.
MORRISON CHANNEL.								
4	Wayne Street.....	Highway...	1.2	79	.....	.....	25.0	Do.
5	Michigan Central R. R	Railway...	1.9	24	26	.....	7.6	Swing. See Note 2.
PAW PAW RIVER.								
6	Cleveland, Cincinnati, Chicago & St. Louis Ry.	Railway...	1.3	.....	.....	43.0	2.4	Bascule. No lights.
7	Pere Marquette Ry...	do.....	1.5	.....	.....	45.0	5.4	Do.
8	Lake Shore Drive.....	Highway...	3.3	.....	.....	40.0	10.0	Do.
9	Paw Paw Avenue.....	do.....	3.8	.....	.....	27.0	10.3	Do.
10	Pere Marquette Ry...	Railway...	3.8	.....	.....	38.7	7.2	Bascule. See Note 3.

¹ Looking downstream toward the lake.

² Opening not available for use.

Signals for opening draws of bridges 1 and 2: Steamer whistles sound 2 short, 1 long (— — —); sailing vessels, 3 long blasts of horn (— — — —). Answered by bell on highway bridge.

NOTE 1.—Red light on each end of each abutment pier, on each end of guard pier, and on each side of center pier; 3 compound red-and-green lights on top of draw (in center and at each end) show red up and down stream when bridge is closed and green when open.

NOTE 2.—Red light at each end of draw rest and on each side of draw opening.

NOTE 3.—Closed by rails spiked across draw.

Local regulations affecting navigation, prescribed by the authorities of Benton Harbor may be obtained from the local authorities. Every mariner should obtain a copy of these regulations and comply with same.

St. Joseph River, Mich.—This is a crooked stream obstructed by numerous shoals with depths in channel crossings of from 2 to 2½ feet. While the nominal head of navigation is at Berrien Springs, navigation in fact for a draft of about 2 feet is limited to the lower one-third of the distance, i. e., 7 or 8 miles upstream from the harbor. During extreme low stages navigation even on this portion is uncertain.

An examination of the river above St. Joseph Harbor made in 1915 showed a channel of navigable width having depths at the existing stage of 3 feet in the lower 9 miles and of 2 to 2½ feet in the lower 15½ miles.

From Berrien Springs to Elkhart, Ind., the river in its original condition was navigable, but is now obstructed by several dams for power purposes.

Bridges across St. Joseph River, St. Joseph Harbor to Berrien Springs.

No.	Location and name.	Kind.	Miles above St. Joseph Harbor.	Draw or span openings— clear width.		Clear height above low water.	Remarks.
				Right. ¹	Left. ¹		
1	Main Street.....	Highway....	0.1	<i>Feet.</i> 73	<i>Feet.</i> 74	<i>Feet.</i> 9.9	Swing. See Note 1.
2	Michigan Central R. R.	Railway....	.4	58	.....	7.6	Swing. See Note 2.
3	Napier.....	Highway....	2	200	200	20-29.0	{Fixed truss: 2 spans—1 over navigable channel. No lights.
4	Pere Marquette Ry	Railway....	5.5	* 94	125	31.0	

¹ Looking downstream.

² Opening not available for use.

NOTE 1.—Two red lights on each abutment and 4 on center pier; 3 compound red-and-green lights on draw span (at center and on each end) show red up and down stream when bridge is closed and green when open.

NOTE 2.—Red light on each end of guard pier, at each end of each abutment pier, and on each side of center pier; 3 compound red-and-green lights on draw span (at center and over middle of each opening) show red up and down stream when bridge is closed and green when open.

Coast.—From St. Joseph, Mich., the coast trends southwest-erly for 35 miles to Michigan City, Ind. From St. Joseph south-ward for 7 miles the shore is a moderate bluff, then for 8 miles to Bald Tom Hill there is a higher range of hills with an elevation of 200 to 400 feet; with the remaining 20 miles the shore is composed of low hills. Southwestward of St. Joseph pier a shifting shoal reaches out about 880 yards from shore.

The Michigan-Indiana boundary line lies about 5 miles northward of Michigan City.

New Buffalo lies about 25 miles southwestward of St. Joseph, at the mouth of a small stream called the Galien River. The entrance is practically filled up and a few piles projecting from the sand is all that remains of the pier.

Michigan City Harbor.—This harbor is about 32 miles east of Calumet Harbor, or South Chicago, and about 38 miles from the mouth of the Chicago River. The portion of Lake Michigan in the vicinity is fully exposed to storms from a northerly direction, the maximum unimpeded sweep from a little east of north being about 300 miles; all severe storms from the arc included between north-northeast and northwest create hazardous conditions, including powerful and dangerous seas, and strong currents running across the harbor entrance from east to west or from west to east, dependent upon the direction of prevailing winds. Michigan City is thus one of the most exposed harbors upon the lake, and an added unfavorable

condition is found in the sandy nature and gentle slope of the lake bottom, depths of 12 to 15 fathoms occurring 8 to 10 miles from shore. The lake shore in the vicinity is composed of fine sand which, in the neighborhood of Trail Creek, is piled up in large dunes. The harbor comprises a protected entrance and an old outer basin formed by breakwaters and piers, and an inner portion formed by the improved channel of Trail Creek.

Outer basin.—The outer basin, on the lake front east of the entrance to the inner channel and originally intended as an outer harbor, is inclosed on the east by a pile pier now about 200 yards long, which is in an unserviceable condition, on the west by the east entrance pier, and on the north by a crib breakwater, 470 yards long, of which the lower portion is still of full section and serviceable, but the upper courses and decks are badly rotted or gone.

The outer basin was never dredged and could not be used by deep-draft vessels, its entrance is practically closed by a sheet-pile pier 465 feet long, connecting the outer end of the inner or old east pier with the inner end of the easterly breakwater pier. An opening about 15 feet wide and $7\frac{1}{2}$ feet deep remains to admit small boats to the basin.

Breakwater and piers.—The structures protecting the entrance to the harbor are the detached breakwater, easterly breakwater pier, and the east and west entrance piers.

The northeasterly crib has a concrete superstructure, with a lighthouse thereon; thence the breakwater bears about southwest by south, its southwest end being 817 yards from shore and 267 yards outside the 18-foot curve. The northeast end of the breakwater is on a line with the harbor face of the easterly breakwater pier, and the clear distance or width of passage between the two is 217 yards. There are no rules concerning mooring vessels to the breakwaters. There are mooring rings along the harbor side of the breakwater for 100 feet from its northeast end, and mooring posts on the east breakwater between the pierhead light and the angle.

The easterly breakwater pier is 379 yards long from the sheet-pile pier which connects it with the inner east pier; the inner 179 yards bears about north-northwest and the outer 200 yards bears about northwest by west. It projects 1,106 feet beyond the crib breakwater of the old outer basin, and its outer end is 970 feet beyond the end of the west entrance pier and 2,400 feet from the shore line.

The channel is protected at the entrance by two piers, and inside by revetments following generally the original course of Trail Creek. The east pier is about 483 yards long, including a sheet-pile pier to close the gap of 155 yards between its former outer end and the southerly end of the easterly breakwater pier. The outer end of the west pier is opposite the inner end of the easterly breakwater pier.

and its length thence to the shore line is about 500 yards. These piers form the approach to the first or lower turning basin.

Channel.—The channel of the harbor is 354 yards long from the outer end of the west pier, between revetments 72 to 87 yards apart to the first turning basin, and from 40 to 50 yards in width above Franklin Street, except for the greater widths at the turning basins, described below. The upper limit of this channel is 100 feet above the upper turning basin. The existing channel requires frequent dredging for its maintenance on account of the sand washed in by storms and the shore currents at the entrance, and because of the dilapidated condition of the revetments inside, and freshets in Trail Creek.

In November, 1920, the channel lakeward of the Franklin Street Bridge was not less than 180 feet wide and 16 feet deep. The channel to a point 1.3 miles above the bridge varied from 40 to 80 feet in width and had a depth 15 feet.

Turning basins.—The lower basin, at the first bend of the channel just above the inner end of the entrance piers, consists of an enlargement of the channel, and affords a width of about 133 yards for turning purposes, with a depth of about 18 feet, but with shallow water near the banks.

The central basin opens off the southwesterly side of the channel. It begins about 167 yards above the Second Street Bridge, and is 71 yards wide and 113 yards long measuring from its southwesterly side across and including the river channel. Its depth and usefulness have been materially reduced by shoaling and by two sunken wrecks in the area near the banks. It is too restricted for anchorage of vessels and too shallow for turning.

The upper basin, at the present upper end of the inner harbor, is 115 yards wide and 133 yards long. There was formerly a narrow, shallow channel practically through the middle of the basin, but this, as well as the remainder of the basin, is practically filled up and the old revetments are in a dilapidated condition.

Light.—A fixed white light, 50 feet above water, visible 13 miles is shown from an octagonal tower on the outer end of east pier.

Fog signal.—A fog signal is made on a steam whistle.

Lights.—A flashing red light, 36 feet above water, visible 6 miles is shown from a red pyramidal structure on the northern end of the breakwater.

A flashing red light, 27 feet above water, visible 8 miles, is shown from a red cylindrical tower, north end of the west pier.

A Coast Guard station is located on the east side of the harbor entrance.

Storm warnings.—Day and night signals are displayed from a steel tower on the Coast Guard reservation about midway between the station and the sea wall to the north.

Bridges across the inner harbor at Michigan City.

No.	Location and name.	Kind.	Miles from outer end of west pier.	Draw openings—clear width.			Clear height above low-water datum.	Remarks.
				Right. ¹	Left. ¹	Center.		
				Feet.	Feet.	Feet.	Feet.	
1	Turning Basin No. 1.....		0.35					
	Franklin Street.....	Highway	.51			79.6	11.6	Bascule.
2	Michigan Central R. R.....	Railway	.88	46.4	37.8		7.4	Swing.
3	Second Street.....	Highway	.94	45.5	45.3		5.7	Do.
	Turning Basin No. 2.....		1.04					
4	Sixth Street.....	Highway	1.20	40.8	44.3		8.3	Do.
	Turning Basin No. 3.....		1.68					
5	Lake Erie & Western R. R.....	Railway	1.92			20	20.3	Trestle: height given to bottom of floor beams.

¹ Looking downstream toward the lake.

Whistle signals for opening draws: Highway bridges, 3 blasts (— — —); Michigan Central Railroad bridge, 5 blasts (— — — — —).

LIGHTS.—The bridges are all provided with red lights on abutments, protection piers, and the movable structures, those on the last-named parts being so arranged as to show red when the bridge is closed and green when open.

City regulations affecting navigation may be obtained from the local authorities. Every mariner should obtain a copy of these regulations and comply with them.

Coast.—From Michigan City the coast trends west-southwest for 22 miles to Gary Harbor. It may be approached to within 660 yards, and is bordered by hills 100 to 200 feet high.

Gary Harbor.—This harbor is at the southerly extremity of Lake Michigan, about 12½ miles southeast by east from Calumet Harbor entrance.

The harbor is artificial, formed by piers built 83 yards apart, extending into the lake 667 yards to 25 feet depth of water. It is stated to have a depth of 23½ feet, and is extended inland from the shore line a distance of 1,188 yards, terminating in a turning basin 250 yards in diameter.

A breakwater designed to protect the harbor entrance was completed in 1911. From a point 167 yards west of the west pier the breakwater extends north and then north-northeast and east-northeast a total distance of 1,067 yards into the lake and across the prolongation of the channel.

A water-intake crib about 60 feet in diameter, with its top submerged to a depth of 26 feet below low low-water datum, is located in 40 feet of water, 1,652 yards west of the center line of the piers and 2,452 yards from the shore.

Lights.—A group flashing white light, 40 feet above water, visible 13 miles, is shown from a maroon cylindrical tower on the outer end of the breakwater.

A fixed green light, 25 feet above the water, visible 4 miles, is shown from an unpainted, pyramidal, tower located on the outer end of the west pier.

Fog signal.—The fog signal is made on an air siren.

Range lights—Front light.—A fixed white light, 30 feet above water, visible 8 miles, is shown from an unpainted pyramidal tower on the outer end of the east pier.

Rear light.—A fixed red light, 45 feet above water, visible 6 miles, is shown from an unpainted pyramidal tower 83 yards 181° (S. $\frac{1}{2}$ E.) from the front light.

These lights in range mark the course for the entrance.

Coast.—From Gary the coast trends northwest for $6\frac{1}{2}$ miles to Indiana Harbor. The shallow bank along this shore has a width of 660 yards except at Indiana Harbor where a foul area, Indiana Shoals, extends 5 miles offshore.

Indiana Harbor is an artificial roadstead formed by the construction of two piers projecting into the lake and by the excavation of the inclosed area and an inner harbor.

Indiana Shoals.—The approach to Indiana Harbor is obstructed by a foul area which extends to the northeastward 5 miles with several ridges of 13 to 18 feet depth.

Light and bell buoy.—A red conical buoy, showing an occulting white light, is moored in 47 feet on the northeastern side of Indiana Shoals.

Fog signal.—The fog signal is made on a bell sounded by the action of the waves.

Buoy.—A spar buoy is moored alongside the light buoy.

Outer harbor and entrance channel.—The harbor channel is about 1,067 yards long from the railroad bridges to the outer corners of the extension fill, bearing $46^{\circ} 11'$ (NE. $\frac{1}{2}$ N.); then the outer channel continues on the same line for about 533 yards, and then on an angle to north by west for about 800 yards to its lake end on the west side of Indiana Shoals. This channel has a width of 117 yards, except for a length of about 123 yards located about 520 yards from the outer end, and a length of about 117 yards at the inner end, where the width is 100 yards; also, at the angle, increased width was obtained by cutting off the corner on its west or inner side. Soundings in 1919 indicated a clear depth of 21 feet over the entire channel, except on the axis of the channel between the wharves, where a very soft fill had reduced the depth to about $19\frac{1}{2}$ feet.

Lights.—An occulting white light, 24 feet above water visible 8 miles, is shown from an unpainted post on the crib, on the harbor side of the breakwater.

A flashing white light, 45 feet above water, visible 12 miles, is shown from a white skeleton tower, to mark the east pierhead.

Light and bell buoy.—A black cylindrical buoy, showing a flashing white light, is moored in 25 feet at the east side of the entrance to the dredged channel.

Fog signal.—The fog signal is made on a bell sounded by the action of the waves.

Buoy.—A black spar buoy is moored alongside the light and bell buoy.

Light buoy.—A red cylindrical buoy, showing a flashing red light, marks the eastern end of the northern arm of the breakwater.

Buoys.—A red spar buoy marks a shoal on the outer western end of the channel.

Three black spar buoys mark the edge of the shoal on the eastern side of the channel.

Inner harbor.—The channel through the five railroad bridges at the entrance to the inner harbor or canal contracts to the clear width of the span openings about 65 feet. Considerable shoaling, due to deposits from sewers, occurs in the vicinity of these bridges, the controlling depth, both above and below them, being about 20 feet. From these bridges the inland canal extends southwesterly in line with the outer harbor for about 1.4 miles. Here the canal divides and a branch runs about 1.6 miles westerly to and into a large shallow pond or swamp called Lake George, while the main channel extends from the forks about 2 miles southward to a point on the Grand Calumet River about $2\frac{1}{2}$ miles east of Hammond. A turning basin 133 yards by 213 yards (including width of channel) is located about 1 mile up from the outer harbor. The canal for a little over 1 mile above the Franklin Bridge has a width of about 200 feet, a depth of 20 feet, and a bottom width of 80 feet.

The entrance to the turning basin is blocked by a shoal having depths of from 15 to 17 feet, the depth in the turning basin being generally greater. In the Lake George Branch a channel about 50 yards wide and over 21 feet deep extends along the north bank about 300 yards from the forks, and the south side of the channel has depths varying from 14 to 19 feet.

Wharves.—A public wharf 300 feet long has been built on the southeasterly bank of the canal adjoining the southerly side of Canal Street. The wharf and a strip of land 50 yards wide back of it are to be available to the public on equal terms. The wharf has been planked and a roadway provided from Canal Street, but as yet there is no railroad connection. Two other similar wharves are contemplated, one near One hundred and forty-first Street in the main canal and one in the Lake George Branch.

Bridges across Indiana Harbor Canal.

No.	Location and name.	Kind.	Miles from harbor entrance.	Draw opening—clear width, center.	Clear height above low-water datum.	Remarks.
MAIN CHANNEL.						
1	Elgin, Joliet & Eastern Ry.....	Railway	0.62	<i>Fect.</i> 67.5	<i>Fect.</i> 7.5	Bascule.
2	Baltimore & Ohio R. R.....	do.....	.64	78.8	7.7	Do.
3	New York Central R. R.....	do.....	.65	65	6.9	Do.
4	do.....	do.....	.66	64.6	6.8	Bascule. Used by Indiana Harbor Belt R. R.
5	Indiana Harbor Belt R. R.....	do.....	.67	62.5	7	Bascule.
6	Pittsburgh, Fort Wayne & Chicago R. R.....	do.....	.91	62.8	5.5	Do.
7	Dickey Place.....	Highway	1.14	66	11.3	Do.
8	Turning Basin.....	do.....	1.61			Do.
9	Canal Street.....	do.....	1.79	65.3	7.3	Do.
9	Elgin, Joliet & Eastern Ry.....	Railway	1.81	65	4.3	Do.
	The Forks.....	do.....	2.01			At junction with Lake George branch.
10	One hundred and forty-first Street.....	do.....	3.01			Bascule authorized—not built.
11	Near One hundred and forty-first Street.....	Highway	3.01	42	6.8	Temporary trestle.
12	South Chicago & Southern and Baltimore & Ohio Chicago Terminal R. R.....	Railway	3.11	34.2	2.6	Fixed. Bascule authorized.
13	Chicago Avenue.....	Highway	3.19	66	7.3	Bascule.
14	One hundred and fifty-first Street.....	do.....	3.76	66	10.3	Do.
15	Indiana Harbor Belt R. R.....	Railway	3.89	36	3.6	Fixed.
16	Elgin, Joliet & Eastern Ry.....	do.....	3.90			Bascule authorized.
LAKE GEORGE BRANCH.						
17	Forsyth Avenue.....	Highway	2.51	65	10.3	Bascule.
18	Baltimore & Ohio Chicago Terminal R. R.....	Railway	2.94	65	10.4	Do.
	Lake George shore.....	do.....	3.53			

Coast.—From Indiana Harbor the coast trends northwestward for 6½ miles to Calumet Harbor, Ill. This part of the coast is low and marshy; the shallow bank extending off from it has a width of 660 yards from Indiana Harbor to Wolf River Piers and 880 yards from the latter to Calumet Harbor; about 880 yards southeast of Calumet Piers shoals with depth of 10 to 12 feet are found 1 mile from shore. The Indiana-Illinois boundary line lies about 1 mile northwest of Wolf River Piers.

Wolf River Piers, Ind., built by private enterprise with a view to the formation of a harbor, are located about 2½ miles southeast of Calumet Harbor, Ill., and 4 miles northward of Indiana Harbor, near the Illinois-Indiana State line. A pier extends about 200 yards out from the shore line on the north side of the entrance; also a pier 360 yards long was built on the south side of the harbor, parallel to and about 100 yards distant from the north pier. The Wolf River, a short distance above its mouth, is crossed at intervals of about 200 to 400 feet by the Chicago, Lake Shore & Eastern Railroad, the Baltimore & Ohio Railroad, the New York Central Railroad, and the Pittsburgh, Fort Wayne & Chicago Railroad, and by Indiana Boulevard. All these bridges are fixed trestles without draws, and there is no connection from Lake Michigan to the river, the mouth of the latter being closed up.

CHAPTER XVII.

LAKE MICHIGAN—WESTERN SHORE—CHICAGO TO GREEN BAY.

Plan.—This chapter begins with Chicago and continues northward along the western shore to Green Bay.

Chicago, the second largest city in the United States and the fourth largest in the world, extends for about 26 miles along the southwestern shore of Lake Michigan.

The city is about 14 feet above the lake level and 600 feet above sea level. It is divided into three parts—north, south, and west sides—by the narrow and tortuous Chicago River, the navigable portions of which are within the city limits.

Chicago is the center of the vast railroad system of the United States, which, with its favorable location on the Great Lakes, gives the city a large share of the lake commerce.

The population is 2,701,705 (1920).

Trade.—During the year 1919 the aggregate net registered tonnage of vessels entering Chicago and Calumet Rivers was 6,175,155 tons. In the same period the aggregate net registered tonnage of vessels clearing from Chicago and Calumet Rivers was 6,123,662 tons.

Industries.—The industries of Chicago are as varied as they are extensive. The city is the greatest grain and lumber market in the world. The extensive Union Stock Yards, for slaughtering cattle and hogs and preparing the meat products, cover an area of over 400 acres.

Manufactures.—Among the more important manufactures of Chicago may be mentioned those of railway cars, locomotives, agricultural implements, mining appliances, clothing, electrical apparatus, furniture, pianos, cigars, chemicals, and flour.

The steel and iron industry is conducted on an enormous scale. Some of the largest rolling mills in the world are located there.

Climate.—The climate of Chicago, while generally healthy, is not altogether agreeable, owing to the high winds which prevail, principally during the winter months.

Repairing facilities.—The Chicago Ship Building Co. has all facilities for the repair of vessels.

Several small concerns have facilities for the construction and repair of small boats and have small marine ways, but no dry docks.

Calumet (South Chicago) Harbor, located about 6½ miles northwest of Indiana Harbor, is a part of the port of Chicago.

Piers and Breakwater.—The works of improvement include the two piers at the mouth of the Calumet River and the outer breakwater. The piers are 100 yards apart, except at a point 100 yards southwesterly from the outer end of the south pier and extending thence to the Elgin, Joliet & Eastern Railroad Bridge, where the channel is being widened to 115 yards by the removal of this section of the south pier and the construction of a new concrete pier; this work has been completed except to within 200 yards of the outer end of the south pier. The piers bear $60^{\circ} 31' 31''$ (NE. by E. $\frac{1}{4}$ E.); the south pier projects about 768 yards and the north pier about 1,007 yards beyond the original shore line where the Elgin, Joliet & Eastern Railroad Bridge now stands. The breakwater as originally built was 1.4 miles long, extending due east from the north pier of the Illinois Steel Co.'s north harbor a distance of 1,488 yards, and thence in a southeast direction 820 yards; but 200 feet of its inner end is now shoreward of the authorized bulkhead of the Illinois Steel Co. The breakwater affords protection to the river entrance and to an exterior harbor about $\frac{1}{2}$ square mile in area.

Channel and sheltered area.—In addition to the works of construction, the deepening of the channel between the piers, the approach of the harbor, and the area sheltered by the breakwater, has been completed to a depth of 21 feet.

Soundings in 1919 indicated a clear channel over 21 feet deep for a minimum width of about 125 feet up to the concrete dock of the Iroquois Iron Co., where the width increases to about 100 yards. The area sheltered by the breakwater has a depth greater than 21 feet, except in front of the bulkhead of the Illinois Steel Co. between the north harbor pier and the steel company's north slip, where the depth varies from 15 to 21 feet for a distance of about 533 yards east of the bulkhead. A small shoal, supposed to be of soft material, with least depth of 20 feet, is located about 800 yards from the steel company's north slip, on a line between the slip and the outer end of the breakwater.

Lights.—An alternating fixed white and flashing red light, 40 feet above water, visible 13 miles, is shown from a red cylindrical tower, on the southeastern end of the breakwater.

A fixed red light, 36 feet above water, visible 9 miles, is shown from a red cylindrical tower on the outer end of the North Pier.

Fog signal.—The fog signal is made on an air siren.

A Coast Guard station is located on the north side of the harbor entrance.

Storm warnings.—Day and night signals are displayed from a steel tower on the southwest corner of the lighthouse reservation.

Illinois Steel Co.'s private harbor.—The north slip is 1,000 yards north of Calumet River entrance and is approached through

deep water in the area sheltered by the breakwater. The south slip opens off the north side of the Government entrance channel near its inner end. Both slips have a depth of 21 feet.

There is a bulkhead on a line between the north harbor pier and the steel company's north slip, and the space back of this bulkhead is nearly filled in.

Lights.—A fixed red light, 32 feet above water, visible 6 miles, is shown from a red post on the south side of the entrance to the slip.

A fixed green light, 32 feet above water, visible 4 miles, is shown from a green post on the north side of the entrance to the slip.

Calumet River, Ill. and Ind.—The Calumet River empties into Lake Michigan at South Chicago, and its mouth is known as Calumet or South Chicago Harbor (previously described). About 6 miles up the river from the east end of the north pier is a place known as the Forks, where there is a private connection with Lake Calumet. About $1\frac{1}{2}$ miles above the Forks, or about $7\frac{3}{4}$ miles from the end of the North Pier, is the Junction or head of the main Calumet River, at the confluence of the Little Calumet and the Grand Calumet Rivers.

Lake Calumet.—The channel from the Forks connecting with Lake Calumet is narrow and shallow. Lake Calumet is about $3\frac{1}{2}$ miles long north and south and about $1\frac{1}{2}$ miles wide, with about 3 feet average depth at low-water datum, and it has practically the same level as Lake Michigan.

The Grand Calumet is a shallow lagoon or bayou about 18 miles long, with only a small drainage area, with banks rising just above the water surface, and having no current except what is caused by floods and freshets or by fluctuations in Lake Michigan. The city of Hammond, Ind., is situated on the Grand Calumet about $2\frac{3}{4}$ miles above the Junction. About $2\frac{1}{2}$ miles east of Hammond there is a connection with Lake Michigan through the Indiana Harbor Canal. Above the section included in the channel under improvement, the river is navigable by light-draft launches, such as can pass under bridges, nearly to Gary, about 20 miles from the river mouth.

The Little Calumet is about 60 miles long, with a large drainage area having a large flood discharge but small low-water discharge. It is navigable for 6-foot draft to Riverdale, about 12 miles from the main river mouth, and for light-draft launches, such as can pass under bridges, to the site of an old stone dam at the village of Blue Island, Ill., about 14 miles from the mouth. The river is not navigable above Blue Island except by rowboats, and rapids with rock bottom obstruct even these to some extent.

Channel.—The channel is 100 yards wide between the piers (except where being widened to 350 feet as noted under Piers and

Breakwater, Calumet Harbor), decreasing gradually to 200 feet width near Ninety-second Street; this 200 feet is the projected width to turning basin No. 5 at the Forks, and the required width and depth have been obtained to that basin except as noted.

The condition of the channel and turning basins given below is based on soundings taken in 1917, verified by a general examination in 1919. Since then it is probable that considerably more shoaling has occurred than is indicated.

The left draw of the Elgin, Joliet & Eastern Railroad bridge is obstructed by a shoal having least depth of about $19\frac{1}{2}$ feet. From this bridge up to the dry dock near One hundred and second Street the channel is generally over 21 feet deep except for a few scattered shoals having depths of from 19 to 20 feet. Depths of 16 feet are found immediately in front of the entrance to the old dry dock on the right bank. From One hundred and second Street to the docks of the Federal Furnace Co. near One hundred and eighth Street considerable shoaling has occurred along the right bank, except that for a distance of about 700 feet above One hundred and sixth Street bridge the shoal projects nearly to midstream from the left bank.

In the rock section between One hundred and eleventh and One hundred and fourteenth Streets there is a depth of about 21 feet for width of 200 feet. The rock bottom here makes it inadvisable to depend upon the full depth, and allowance should be made for fluctuations in water surface. While complete soundings of 1919 indicate minimum depths of about $19\frac{1}{2}$ feet, it is not considered safe to traverse the rock section with a vessel drawing more than $18\frac{1}{2}$ feet when the water surface is at the stage of low-water datum. This rock section will be deepened to 23 feet.

As a result of dredging the channel above the rock section at One hundred and fourteenth Street is more than 21 feet deep for a width of 80 feet in midstream up to a point about 117 yards below turning basin No. 3 (between One hundred and fifteenth and One hundred and Sixteenth Streets), then 40 yards wide along the easterly side of the channel to the southerly or upper end of the turning basin. From the turning basin to the bend in front of the General Chemical Co. near One hundred and twenty-second Street the available depth is about $19\frac{1}{2}$ feet. Parallel to and about 100 feet from the docks at the Chicago & North Western Railway grain elevator a shoal having least depth of about 18 feet extends nearly the full length of the dock.

From One hundred and twenty-second Street to a point about 233 yards above Torrence Avenue the channel has been deepened to 21 feet for the full width of 667 yards, but has shoaled to a considerable extent. From the last-named point to the Forks the sides of the channel were dredged to 21 feet depth in 1916 so as to complete the

full project width of 200 feet. The controlling depth up to the Forks is about 16 feet.

Between turning basin No. 5 and Hammond, Ind., the depth varies from 6 to 8 feet to the Junction and from 2 to 4 feet thence (via the Grand Calumet) to Hammond, with width of from 20 to 40 feet. From Hammond to the entrance to Indiana Harbor Canal the depth is about 4 feet and the width about the same as that adjoining downstream.

Turning basins.—Basin No. 1, near Ninety-third Street, practically including the old turning basin opposite Counselman's elevator slip, is about 233 yards in diameter; it was redredged to 21 feet depth, but considerable shoaling has since occurred, especially over the northerly and easterly portions, where the available depths are about 18½ feet.

Basin No. 3, on the east bank of the river between One hundred and fifteenth and One hundred and sixteenth Streets, completed in 1915 to 21 feet depth, has a diameter of about 190 yards; but the distance east and west, including the river channel, is about 233 yards. It has the full project depth.

Basin No. 5, at the Forks, has a diameter of about 250 yards and has been deepened to 21 feet; but this has been reduced by shoaling to depths varying between 17 and 20 feet.

Dry docks.—The Chicago Ship Buildings Co. has two dry docks No. 1 and No. 2, at One hundred and first Street and Calumet River with the following dimensions:

No. 1, length 554 feet, width 80 feet, and a depth of 16 feet over the sill.

No. 2, length 700 feet, width 80 feet at the bottom and 103 feet at the top, with a depth of 16½ feet over the sill.

Bridges, etc., Calumet River and its branches.

No.	Location and name.	Kind.	Miles from east end of north pier.	Draw openings—clear width.			Clear height above low-water datum. ²	Remarks.
				Right. ¹	Left. ¹	Center.		
MAIN RIVER.								
1	Elgin, Joliet & Eastern Ry. Cable over bridge.	Railway Power	0.71	Feet. 92.5	Feet. 89.8	Feet. -----	Feet. 5.7	Swing.
2	Ninety-second Street.	Highway	.86	-----	-----	200	142.2	Bascule.
	Turning Basin No. 1		1.00	-----	-----	-----	16.8	
3	Ninety-fifth Street.	Highway	1.19	-----	-----	120	17.3	Do.
4	Baltimore & Ohio R. R.	Railway	1.38	-----	-----	138.5	17.8	Do.
5	New York Central R. R.	do.	1.41	-----	-----	138.5	22.8	Lift. See Note 1.
6	Pittsburgh, Fort Wayne & Chicago R. R.	do.	1.43	-----	-----	138.5	22.8	Do.
	Turning Basin No. 2.		2.46	-----	-----	-----	-----	Proposed.
7	One hundred sixth Street.	Highway	2.68	65	70.5	-----	8.3	Swing.
	Turning Basin No. 3.		4.00	-----	-----	-----	-----	
	Turning Basin No. 4.		5.00	-----	-----	-----	-----	Proposed.

¹ Looking downstream toward the lake.

² The river surface during dry summers differs only a few inches from lake surface; but in spring and wet seasons the river surface may exceed the lake surface by 1.5 feet at 21 miles on the Grand Calumet, and by 1 foot at the Junction.

Bridges, etc., Calumet River and its branches—Continued.

No.	Location and name.	Kind.	Miles from east end of north pier.	Draw openings—clear width.			Clear height above low-water datum.	Remarks.
				Right.	Left.	Center.		
MAIN RIVER—contd.								
8	Calumet Western Ry.	Railway	5.24	85	83.1	.....	16.3	Swing.
9	Chicago & Western Indiana R. R.	do.	5.39	.....	.....	120	11.3	Bascule.
10	Torrence Avenue.....	Highway	5.43	.....	.....	70	7.8	Temporary p o n- toon.
11	Overhead wire.....	Power..	5.44	.....	.....	.....	120	Swing.
	New York, Chicago & St. Louis R. R.	Railway	5.73	78.2	80	.....	7.3	
12	Turning Basin No. 5 at the Forks. ....	.....	6.18	.....	.....	.....	.....	Do.
	Overhead wire.....	.....	6.50	.....	.....	.....	120	
	Illinois Central R. R.	Railway	6.51	(*)	91.5	.....	12.7	
	"The Junction".....	.....	7.83	.....	.....	.....	.....
GRAND CALUMET.								
13	South Chicago & Southern Ry.	Railway	8.51	68.1	(*)	.....	9.3	Swing.
14	Rand Avenue, West Hammond.	Highway	9.32	(*)	63.1	.....	10.3	Do.
15	Baltimore & Ohio Chicago Terminal R. R.	Railway	9.63	53.5	63.1	.....	9.3	Do.
16	Indiana Harbor Belt R. R.	do.	10.14	(*)	55	.....	7	Do.
	State Line Illinois and Indiana. ....	.....	10.16	.....	.....	.....	.....
17	Chicago, Indianapolis & Louisville Ry.	Railway	10.37	.....	.....	80	9.1	Bascule.
18	New York, Chicago & St. Louis R. R.	do.	10.42	84.6	(*)	.....	9.5	Swing.
19	Hohman Street, Hammond.	Highway	10.59	.....	.....	77.1	7.3	Bascule.
20	New York Central R. R.	Railway	10.84	46	(*)	.....	7.3	Swing.
21	Calumet Avenue, Hammond.	Highway	11.14	.....	.....	36	7.4	Temporary.
22	do.	do.	11.14	.....	.....	66	4.4	Bascule being built.
23	Columbia Avenue.	do.	11.62	(*)	40	.....	7.9	Swing.
24	Forsyth Avenue, East Chicago.	do.	12.90	29.5	29.5	.....	7.3	Do.
25	Chicago, Indianapolis & Southern R. R.	Railway	14.19	.....	.....	14.3	7.4	Fixed.
26	Gibson.	Highway	14.22	.....	.....	12.8	6.9	Trestle.
27	Kennedy Avenue.	Electric Ry.	14.23	.....	.....	12	7	Do.
28	Chicago, Lake Superior & South Bend Ry.	Railway	15.94	.....	.....	15	10.6	Pile.
29	Cline Avenue.	Highway	16.03	.....	.....	12	8.3	Trestle.
30	do.	Electric Ry.	16.04	.....	.....	14	8.3	Do.
31	Elgin, Joliet & Eastern Ry.	Railway	16.55	.....	.....	13	10.6	Pile.
32	Clark Road.	Highway	18.15	.....	.....	34	7	Fixed.
33	Pittsburgh, Fort Wayne & Chicago R. R.	Railway	18.53	.....	.....	14	11.2	Pile.
34	Wabash R. R.	do.	18.57	.....	.....	14	8.9	Do.
35	Ambridge Street, Gary.	Highway	19.79	.....	.....	52	9.3	Fixed steel arch.
36	Buchanan Street.	do.	20.50	.....	.....	40	12	Do.
37	Gary Land Co.	do.	21.02	.....	.....	31	20.3	Trestle.
38	Elgin, Joliet & Eastern Ry.	Railway	21.03	.....	.....	31	20.3	Do.
39	Baltimore & Ohio R. R.	do.	21.04	.....	.....	14	18.2	Arch culvert.
40	New York Central R. R.	do.	21.06	.....	.....	14	16	Do.
41	Chicago, Indianapolis & Southern R. R.	do.	21.08	.....	.....	13	25.6	Trestle.
42	Gary (Footmans).	Highway	21.09	.....	.....	30	16.8	Do.
43	Broadway, Gary.	do.	21.74	.....	.....	60	17.7	Concrete arch.
44	Virginia Street.	do.	22.15	.....	.....	32	10.9	Fixed steel arch.
45	Elgin, Joliet & Eastern Ry.	Railway	22.25	.....	.....	6	20.3	Trestle.
46	Miller Road.	Highway	25.46	.....	.....	.....	.....	Do.
LITTLE CALUMET.								
47	Michigan Central R. R.	Railway	8.66	(*)	64.7	.....	8.8	Swing.
48	Chicago & Western Indiana R. R.	do.	11.31	62	(*)	.....	16.1	Do.

*Not available.

Bridges, etc., Calumet River and its branches—Continued.

No.	Location and name.	Kind.	Miles from east end of north pier.	Draw openings—clear width.			Clear height above low-water datum.	Remarks.
				Right.	Left.	Center.		
	LITTLE CALUMET—contd.							
49	Indiana Avenue, Riverdale.	Highway	11.57	65	65	.....	13.6	Swing.
50	Illinois Central R. R.	Railway	11.76	61.1	(*)	.....	13.7	Do.
51	do	do	11.76	.....	.....	70	16.8	Trestle.
52	Pittsburgh, Cincinnati, Chicago & St. Louis Ry.	do	13.34	51.8	51.8	.....	14.5	Swing.
53	South Halsted Street..... Stony Creek.....	Highway	13.88 14.48	68	68	.....	12.5	Do.
54	Ashland Avenue..... Old stone dam.....	Highway	14.99 15.19	(*)	81.9	.....	11.3	Connection with Sag Channel.
55	Riverdale Road (Blue Island).	Highway	15.19	.....	.....	52	.....	Fixed.

* Not available.

Whistle Signal for Opening Draws (see Regulations, below), 3 short (— — —).

Note 1.—Nos. 5 and 6 are vertical lift bridges, each composed of two separate lifts, operated independently, having vertical clearance of 120 feet when up.

Regulations to govern the opening of drawbridges over the Calumet River, Illinois and Indiana, prescribed by the Secretary of War:

THE REGULATIONS.

1. The persons operating the bridge shall provide and maintain suitable signals for signaling vessels. The signal for use in the day-time shall be a red ball not less than two feet in diameter; for use at night it shall be a red lantern; arranged in both cases so as to be visible on the river for a distance of at least 600 feet in each direction from the bridge.

2. A vessel approaching the bridge and desiring to pass shall give a signal consisting of three short sounds of the whistle or horn given in rapid succession.

3. When a vessel gives the above signal, the bridge shall be immediately opened, unless a train be on the bridge or approaching it so closely as to be unable to stop; and in that case the bridge may be kept closed long enough for the passage of one train and no more.

4. When the bridge can not be opened immediately after the signal from the vessel, the bridge tender shall hoist the signal specified in paragraph 1, and shall keep it elevated until the bridge can be opened, when he shall lower it.

5. Vessels shall not attempt to pass the bridge while the bridge signal is up, or while the bridge is in course of opening or closing.

6. The bridge shall not be used for switching purposes.

7. The locking devices for securing the bridge when closed must be such as can be promptly opened. The use of splices bolted to the

rail which involve the screwing or unscrewing of nuts whenever the bridge is closed or opened, is forbidden.

Rules and regulations relating to navigation, prescribed by the Chicago City Council, may be obtained from the local authorities, and should be carefully followed.

Lake front, Calumet Harbor to Grossepoint.—From Calumet Harbor northward past Chicago to Grossepoint, a distance of about 25 miles, the lake front is badly obstructed by an offshore bank from 880 yards to 1 mile wide, and farther out by numerous detached shoals, spots, and water-intake cribs.

Calumet Bar (Rockefeller Shoal), off Calumet Harbor, is of sand formation, no rock being found at depths of 24 and 26 feet. A survey of the bar showed it to be about 833 yards long north and south within the 24-foot curve and about 183 yards in greatest width, at about mid-length. About 113 yards from its southerly end is a depth of $18\frac{1}{2}$ feet, located about 827 yards 52° (NE. $\frac{1}{2}$ E.) from Calumet Harbor Light and about 3,700 feet east of the angle of the breakwater. The shoalest spot found on the bar, 15 feet, is about 430 yards north of the preceding spot and about 1,167 yards 35° (NE. by N.) from the harbor light.

Light and bell buoy.—A red and black conical buoy, showing an occultating white light, 10 feet above the water, visible 9 miles, is moored in 21 feet on the northern end of Calumet Bar.

Fog signal.—A bell is sounded by the action of the waves.

Buoy.—A black spar buoy is moored alongside the light and bell buoy.

Clarke Point and Cheltenham Shoals.—Clarke Point Shoal extends 1,540 yards northeasterly from shore, about 1 mile northerly of Calumet Breakwater, has limiting depths of 6 to 10 feet. Cheltenham Shoal, about 440 yards northerly of the breakwater, reaches 880 yards offshore and has a least depth of 6 feet.

Buoy.—A red spar buoy marks the outer end of Clarke Point Shoal.

Jackson Park lagoon.—Jackson Park, about $6\frac{1}{2}$ miles south of the mouth of Chicago River, has two entrances into its lagoons. The northerly entrance, about 633 yards south of the north boundary of the park, has two pile piers about 100 feet apart. The northerly pier is about 203 yards long, the southerly pier about 100 yards, with a boat channel about 4 to 6 feet in depth between them. A highway bridge with a vertical clearance of about 10 feet is built across the channel at the inner end of the piers.

The southerly entrance, about 3,200 feet farther south, is protected on its north side by the Casino Pier, which extends easterly 467 yards to an angle, and thence 367 yards north by east. The angle and the outer end of the pier are each marked by a light showing a

red flash. The shore end of the pier is marked by a fixed red light. The lights are in operation from March 31 to December 1 each year. On the north side of the pier, in the angle between it and the shore, there is a bathing beach, the pier serving to retain the sand of the beach. The south bank of the entrance, which is short, is a granite wall, carrying a green light. The entrance itself has a width of about 67 yards, a channel depth of about 10 feet, and leads directly into a lagoon which here forms a yacht harbor. In 1915 the approach to the yacht harbor was dredged to a least depth of 10 feet. Inside the harbor the depths vary from 8 to 12 feet, the greater depth being maintained throughout the channel and in the central part of the harbor, in which numerous anchorages for small craft are maintained by the South Park Commissioners.

Coast Guard Station.—There is a Coast Guard Station in Jackson Park at the northerly side of the yacht harbor.

Buoys.—Jackson Park Yacht Club racing buoys (white spar) are maintained from May 15 to November 15 each year, as follows:

West Buoy, about 333 yards 154° (SSE. $\frac{1}{2}$ E.) from Casino Pier Outer Light.

North Buoy, 3 miles 26° (NNE. $\frac{1}{2}$ E.) from West Buoy.

East Buoy, 3 miles 146° (SE. $\frac{3}{4}$ S.) from North Buoy and 3 miles 86° (E. $\frac{1}{2}$ N.) from West Buoy.

Lights.—A flashing red light, 18 feet above water, visible 7 miles, is shown from a square, skeleton, pyramidal structure on the outer end of the extension of the pier.

A flashing red light, 22 feet above water, visible 7 miles, is shown from a black post on the outer end of the pier.

A fixed red light, 37 feet above water, visible 8 miles, is shown from a black post on the south side of the inner end of the north pier.

A fixed green light, 33 feet above water, visible 6 miles, is shown from a black post on the south side of the inner end of the south pier.

These lights are maintained from April 1 to November 30.

Hyde Park (Sixty-eighth Street) and Edward F. Dunne Crib.—Hyde Park Crib lies a little over 3 miles east-southeast from Chicago Beach Hotel, about 2 miles 80° (E. by N.) from Jackson Park Pier Light, and $3\frac{1}{2}$ miles 357° (N. $\frac{1}{2}$ W.) from Calumet Pier-head Light. Edward F. Dunne Crib, about 109 feet in diameter, at an elevation of 28.8 feet above low-water datum, lies with its center about 67 yards southeast of the Hyde Park Crib Light, and with a clear space of about 45 feet between the two cribs; it is a little over 2 miles from the shore in line with Seventy-third Street extended, in 30 feet of water.

Lights.—A flashing red light, 70 feet above the water, visible 10 miles, is shown from a red structure on Hyde Park Crib.

Fog signal.—A bell is located at the lighthouse.

A fixed red light 25 feet above the water, visible 4 miles, is shown from a red structure located on Edward F. Dunne Crib.

Hyde Park Inner Shoal lies 660 yards east of the outer end of Morgan Shoal; has least depth of $13\frac{1}{2}$ feet.

Hyde Park Outer Shoal is $2\frac{1}{4}$ miles easterly from shore about in line with Morgan and Hyde Park Inner Shoals; it has least depth of $9\frac{1}{2}$ feet.

Madison Park Shoal, with 14 feet least depth, is $1\frac{1}{4}$ miles from shore and 1,100 yards south-southeastward from Hyde Park Inner Shoal, which may be cleared by giving the buoy marking it a berth of 300 feet.

South Park Shoal lies $1\frac{1}{4}$ miles offshore and is 1,100 yards east-southeastward from Madison Park Shoal and 1,100 yards southerly of Hyde Park Outer Shoal; it has $8\frac{1}{2}$ feet least depth.

A shoal with a least depth of 20 feet on it is reported to lie about 1,320 yards 103° (E. by S.) from Hyde Park Shoal.

Buoys.—A red and black spar buoy marks the northern side of Hyde Park Inner Shoal.

A red and black nun buoy marks the northern side of Hyde Park Outer Shoal.

A red and black spar buoy marks the center of Madison Park Shoal.

A red and black can buoy marks the southern side of South Park Shoal.

Oakland and Morgan Shoals.—Oakland Shoal is a spit with 9 feet least depth, extending 1,320 yards from the shore $4\frac{1}{4}$ miles south of the Chicago River entrance. About 1 mile southeasterly from Oakland Shoal, Morgan Shoal reaches 1,320 yards offshore, with depths of 5 to 8 feet.

Buoys.—A black can buoy marks the outer edge of Oakland Shoal and a red spar buoy its shoalest spot.

A black spar buoy marks the outer and a red spar buoy the inner edges of Morgan Shoal.

Wreck.—The remains of the small passenger steamer *Silver Spray*, wrecked in 1914, lies in 6 or 7 feet of water on Morgan Shoal, close to eastward of the inside red spar buoy and out of the way of navigation; its removal is not contemplated. The water is also shallow west of the inside buoys on Oakland and Morgan Shoals.

Four-Mile Crib and Vicinity.—Four-Mile Crib is 2.6 miles $115^{\circ} 30'$ (ESE.) from Chicago Harbor Lighthouse and 4 miles 81° (E. by N.) from Illinois Central Railroad Station near Twelfth Street.

Light.—A flashing white light, 66 feet above the water, visible 12 miles, is shown from a red structure located on Four-Mile Crib.

Fog signal.—The fog signal is made on a bell.

Dangers.—A mud dump, with least depth of about $16\frac{1}{2}$ feet, lies 717 yards 116° (SE. by E. $\frac{1}{4}$ E.) from Chicago Pierhead Range Rear Light. A mound of rock and gravel, about 667 yards long north and south and 200 yards wide, with least depth of about $17\frac{1}{2}$ feet, lies 2.3 miles 269° (W. $\frac{1}{4}$ S.) from Four-Mile Crib. A small pile of rock, with least depth of about 20 feet, lies 1.8 miles 265° (W. $\frac{1}{4}$ S.) from Four-Mile Crib. A wreck or snag, lying in 36 feet of water and showing least depth of about 23 feet, lies 1,100 yards 245° (SW. by W. $\frac{1}{4}$ W.) from Four-Mile Crib. A wreck with a least depth of about 23 feet lies 1.4 miles $166^\circ 30'$ (SE. by E. $\frac{3}{4}$ E.) from Four-Mile Crib; while not a menace under ordinary conditions, it might be dangerous to deep-draft vessels in times of rough weather and low water.

Harrison and Chicago Avenue (2-mile) cribs.—Carter H. Harrison crib is 2.1 miles 26° (NNE. $\frac{1}{4}$ E.) from Chicago Harbor Light at the north side of the harbor entrance. Chicago Avenue (2-mile) crib is 1.1 miles 8° (N. $\frac{1}{4}$ E.) from Chicago Harbor Light. A hard sand and gravel shoal, with $13\frac{3}{4}$ feet least depth, lies 700 yards 344° (N. by W. $\frac{1}{4}$ W.) from the red light on the north-westerly end of the exterior breakwater.

Lights.—A flashing white light, 68 feet above water, visible 12 miles, is shown from a red tower on Carter H. Harrison crib.

A flashing white light, 86 feet above water, visible 10 miles, is shown from a red structure on Chicago waterworks crib.

Fog signals.—A fog signal is made on a bell from each crib.

Outer light and bell buoy.—A black and white cylindrical buoy, showing a flashing white light, 12 feet above the water, visible 8 miles, is moored in 60 feet, 7 miles 75° (ENE. $\frac{1}{4}$ E.) from the Chicago Harbor Lighthouse.

Fog signal.—The fog signal is made on a bell sounded by the action of the waves.

A spar buoy is moored alongside the light and bell buoy.

Lincoln Park Harbors.—About opposite the foot of Aldine Street and about $3\frac{1}{4}$ miles from Chicago River piers is the entrance to a yacht harbor formed by piers constructed in the lake about 467 yards from the shore line, running north and south a distance of about 1 mile. The entrance has a width of about 90 yards and a depth of 18 feet. The harbor has an area of 53 acres, with a depth of about 34 feet in the middle and sloping gradually to the shores, and serves as a refuge for medium-sized craft in stress of weather.

Lights.—A fixed green light, 47 feet above water, visible 10 miles, is shown from a gray skeleton tower located on the north side of the channel leading into the harbor.

Bathing Beach range lights—Front light.—A fixed red light, 19 feet above water, visible 8 miles, is shown from an unpainted pole located off Lincoln Park.

Rear light.—A fixed white light, 20 feet above water, visible 11 miles, is shown from an unpainted pole 40 yards 270° (W. $\frac{1}{4}$ S.) from the front light.

These lights are maintained from April 1 to December 1.

About 1 mile south of the yacht harbor entrance and about $2\frac{1}{2}$ miles north of Chicago River piers is a small harbor with about 10 feet depth, composed of a pier to the north extending about 267 yards from shore, with a small crib (used as an intake to the Fullerton Avenue conduit) connected with the shore by means of a pier, and leaving an entrance of 120 feet width at the narrowest point. This harbor has approximately 65,000 square feet of surface area, and affords shelter for boats 150 feet long with draft not exceeding 10 feet.

Lights.—Two fixed red lights, $3\frac{1}{2}$ feet apart, 18 feet above water, visible 8 miles, is shown from an unpainted pole located off Lincoln Park.

About 880 yards farther south and about $2\frac{1}{2}$ miles north of Chicago River piers the park has an entrance into its lagoon for small boats; the entrance is crossed by a park bridge high enough to allow free entrance of ordinary motor launches.

Lake View, Lawrence Avenue, and Wilson Avenue cribs and vicinity.—Lake View intake crib is located 1.9 miles 81° (E. by N.) from Lake View pumping station (which is on the lake front at the foot of Montrose Boulevard, about 5 miles north of the mouth of Chicago River). Shoreward of this crib and about 467 yards from the shore line, in about 12 feet of water, is Lawrence Avenue intake crib, about 50 yards in diameter and rising about 24 feet above water level.

Wilson Avenue intake crib is about 3 miles from shore on the prolongation of Wilson Avenue and about 1,900 yards east of Lake View crib, a steel structure 70 feet in diameter, surmounted by a granite and brick superstructure rising 46 feet above water.

A shoal area of sand and gravel, with outcropping rock, lies to the northward of Lake View crib. Depths of 24 feet and less prevail over an area which extends $3\frac{1}{2}$ miles easterly from the lake shore at Rogers Park, with the north and south limits $4\frac{1}{2}$ miles and 2 miles, respectively, north of Lake View crib. Masters of deep-laden vessels are cautioned to keep at least 4 miles from shore while navigating in this locality.

Other shoals are found in the vicinity of Lake View crib as follows: A pile of rocks, with 15 feet, 1,333 yards 262° (W. $\frac{1}{4}$ S.) from the crib and a little over 1 mile from shore; a small rock pile, with

11½ feet, 2,033 yards 208° (SSW. ¼ W.) from the crib and 1 mile offshore; a small rock shoal, with 10 feet, 1.7 miles 209° (SSW. ¾ W.) from the crib and about 360 yards 67° (NE. by E. ¼ E.) from the entrance to Lincoln Park yacht harbor. The latter two shoals are menaces to craft using the yacht harbor which draw 10 feet or more.

Lights.—A flashing red light, 55 feet above water, visible 8 miles, is shown from a red skeleton tower on Lake View crib.

Fog signal.—The fog signal is made on a bell.

A fixed red light, 45 feet above water, visible 8 miles, is shown from a skeleton tower located on the Lawrence Avenue crib.

A fixed white light, 35 feet above water, visible 8 miles, is shown from an unpainted wooden structure, the Wilson Avenue crib.

Fog signal.—The fog signal is made on a bell.

Buoy.—A red spar buoy marks a 22-foot spot at the easterly or outer extremity of the shoal area northward of Lake View crib.

Exterior breakwater and outer harbor.—The old exterior breakwater has proved a decided benefit to navigation. It is composed of timber cribs 30 feet wide and is a little over 1 mile long, extending northwest by west from a point 1,557 yards east and 757 yards north of the Chicago River entrance north pierhead. The harbor of refuge between this breakwater and the river entrance has a depth of 18 to 32 feet.

The shore-arm extension of the breakwater, consisting of timber cribs on stone foundation, is 2,250 feet long, extending from a point 133 yards due west of the inner end of the old exterior breakwater toward the point of intersection of the shore line with the north line of Oak Street extended.

The north arm of the southerly extension of the breakwater, of rubble-mound construction, extends 757 yards due south from the southeast or outer end of the old exterior breakwater. At its south end, which is about 1,557 yards due east of Chicago River entrance north pierhead, is a timber crib and concrete lighthouse pier carrying Chicago Harbor Light marking the north side of the 167-yard opening forming the main entrance to the harbor.

About 510 yards of the south arm of the southerly breakwater extension, also of rubble-mound formation, which is 167 yards south of the end of the north arm and has been completed (1920). Vessels should enter the harbor between the flashing red and white light at the south end of the north arm and the occulting white light at the north end of the south arm of the extension.

Lights.—An alternating flashing red and white light, 82 feet above water, visible 17 miles, is shown from a red conical tower at the south end of the north breakwater.

Fog signal.—The fog signal is made on a whistle.

An occulting white light, 48 feet above water, visible 12 miles, is shown from a white skeleton tower at the northern end of the south breakwater.

A flashing white light 55 feet above water, visible 12 miles, is shown from a white square pyramidal tower near the inshore end of the northwest breakwater.

Municipal piers.—The plans for the city's outer harbor contemplate the present construction of two piers, out of five ultimately proposed, for the accommodation of freight and passenger traffic pertaining to the local commerce of the city. Pier No. 2 extends 1,167 yards east from the shore opposite Illinois Street.

The south dock wall of Pier No. 1, about 790 yards long, located about 177 yards south of and parallel to Pier No. 2.

Lights.—An occulting red light, 30 feet above water, visible 12 miles, is shown from a black skeleton mast on the southeast corner of Municipal Pier No. 2.

A fixed red light 30 feet above water, visible 6 miles, is shown from a red skeleton tower on the outer end of Municipal Pier No. 1.

Outer basin and breakwaters.—The easterly and southerly breakwaters at the east and south, with the south pier and the return at the north and the Grant Park Bulkhead and Illinois Central Railroad Wharves at the west, form the so-called outer basin. The easterly breakwater, bearing (south) is about 1,345 yards long, with a shore return at the north end 100 yards long. The southerly breakwater begins 250 yards south of the southerly end of the easterly breakwater and is now about 850 yards long; from the opening between it and the easterly breakwater the southerly breakwater extends south 83 yards, then southwest by south for a distance of 767 yards. The area west of the bulkhead was added to the public park and filled in, thereby reducing the area of the basin to 270 acres.

The basin has a length of about 1.4 miles and greatest width of about 667 yards. Between the easterly breakwater and a north-and-south line 400 yards west of it the area has been dredged to a depth of 21 feet for 1,983 yards from the north boundary of the basin but has shoaled up to depths of about 18 to 19 feet. This dredged area is about 71 acres in extent. The undredged western portion of the basin is very irregular in depth, varying from 9 to 20 feet at low water. The south entrance to the outer basin is 750 feet wide, but the approach in the lake is shallow and available only for boats of from 15 to 16 feet draft.

The work of building bulkheads and reclaiming land along the lake front between Twelfth and Sixteenth Streets, immediately to the southward of the outer basin, was completed under the direc-

tion of the South Park Commissioners. A 200-foot opening was left between the end of the southerly breakwater and the new work.

Entrance channel.—The distance between the Chicago River piers is about 157 yards at the lake end, narrowing to about 107 yards just after passing the north entrance to the basin and to about 67 yards at about 400 yards farther in. The channel from the lake to Rush Street, about 1,533 yards from the end of the north pier, was redredged to a depth of at least 21 feet in 1912. An examination of the harbor entrance, made in 1919, showed the required depth throughout.

Shoal.—A shoal with least depth of 19 feet on it, lies about half-way between the Coast Guard station and the exterior breakwater. It extends northward to the southern edge of the entrance channel.

Vessels passing through the channel should keep the south pier well open.

Lights.—A flashing white light, 29 feet above water, visible 8 miles, is shown from a white pyramidal skeleton tower at the northeast angle of the inner breakwater.

A flashing red light 36 feet above water, visible 10 miles, is shown from a red conical tower on the south end of the north section of the Inner Breakwater.

Range lights—Front light.—A fixed red light, 30 feet above the water, visible 8 miles, is shown from a red oval tower located on the outer end of north pier.

Rear light.—A fixed red light, 43 feet above the water, visible 10 miles, is shown from a red cylindrical tower located 36 yards 271° (W. $\frac{1}{2}$ S.) from the front light.

Fog signal.—The fog signal is made on a bell.

Note.—The largest ships cannot use the docks in Chicago Harbor as the dock space is so confined that these ships can not turn.

Coast Guard stations are located as follows: One at the north end of the easterly breakwater and one at the north side of the yacht harbor, Jackson Park.

Storm warnings.—Day and night signals are displayed from a steel tower on the northeast corner of the outer end of municipal pier No. 2.

A radio station is operated all the year by the U. S. Navy; call letters NUR; working distance, 200 miles.

Anchorage grounds and rules and regulations relating thereto, promulgated by the Secretary of War.

ANCHORAGE GROUNDS.

The Exterior Breakwater Anchorage Ground is bounded by the lines following.

A line parallel with and 100 feet southwardly from the exterior breakwater; a line parallel with and 100 feet west of the southerly extension to the exterior breakwater; a line running in a north-westerly direction and parallel with the exterior breakwater from a point on preceding line 2,000 feet south of the southerly face of the exterior breakwater; a line 1,000 feet northerly from and parallel with the municipal pier; and a line running due north and south through the westerly end of the exterior breakwater.

The North Interior Breakwater Anchorage Ground is bounded by the following lines:

A line 1,600 feet lakeward of and parallel with Grant Park dock line; a line on the north line of Van Buren Street extended lakewardly; a line 1,000 feet lakeward of and parallel with Grant Park dock line; and a line 300 feet south of and parallel with the south side of the Randolph Street Pier.

The South Interior Breakwater Anchorage Ground is bounded by the following lines:

A line running due west from the north end of the southerly breakwater; a line 100 feet west of and parallel with the northerly 250 feet of the said breakwater; a line 100 feet from and parallel with the southerly 2,300 feet of the said breakwater; a line 50 feet north of and parallel with the east-and-west revetment about opposite Eleventh Place; and a line 50 feet lakeward of and parallel with Grant Park dock line, but that portion of the South Yacht Anchorage Ground (hereinafter described), included within these lines, is excepted from this anchorage ground.

The North Yacht Anchorage Ground is bounded by the following lines:

A line 1,000 feet lakeward of and parallel with Grant Park dock line; a line on the north line of Van Buren Street extended lakewardly; a line extending from a point 500 feet lakeward of the Grant Park dock line on the easterly extension of the north line of Van Buren Street to a point 50 feet lakeward of the said dock line on the south line of Adams Street extended eastwardly; a broken line 50 feet lakeward of the Grant Park dock line and the Naval Reserve and Yacht Club buildings; and a line 300 feet south of and parallel with the south side of the Randolph Street Pier.

The South Yacht Anchorage Ground is bounded by the following lines:

A line 1,000 feet lakeward of and parallel with Grant Park dock line; a line running due east from a point on Grant Park dock line 1,500 feet south of the extension of the north line of Van Buren Street; a line 50 feet lakeward of and parallel with Grant Park dock line; and a line 300 feet south of and parallel with the north line of Van Buren Street extended lakeward.

RULES AND REGULATIONS.

1. Vessels in Chicago Harbor may anchor within the anchorage grounds above defined and not elsewhere, except in stress of weather or by permission of the supervisor of anchorages.

2. Vessels measuring more than 50 gross tons shall not anchor within either yacht anchorage ground, but vessels measuring less than 50 gross tons may therewithin anchor or place buoys and moor to them.

3. No buoys shall be placed or maintained in Chicago Harbor outside of the yacht anchorage grounds, except in connection with works for the improvement of navigation.

4. Steamers and motor vessels measuring over 5 gross tons are prohibited from using as a channelway the yacht anchorage grounds.

5. The maneuvering of a vessel by means of a dragged anchor, except within an established anchorage ground or in stress of weather or to avoid collision, is prohibited.

6. No vessel shall place anchors or be allowed to swing outside of anchorage ground limits.

7. The directions of the supervisor of anchorages assigning vessels to parts of the anchorage grounds suitable to their draft, requiring vessels to anchor bow and stern, requiring shifting the anchorage of any vessel within any anchorage ground for the common convenience, or for otherwise enforcing these rules and regulations, shall be promptly executed by owners, masters, and persons in charge of vessels.

8. These anchorage grounds and these rules and regulations supersede those heretofore established.

Chicago River.—The river constitutes the inner harbor of Chicago. The navigable portions are wholly within the limits of Cook County and of the city of Chicago. Originally it was a sluggish bayou or creek nearly stagnant for the greater part of the year, but had a rapid current in rainy seasons, when discharging the water from its own watershed as well as a large quantity which passed from Des Plaines River over the low divide between the two streams. Chicago River is bifurcated, the North Branch joining the South Branch about 1.58 miles from the lake end of the north pier at the entrance, and the South Branch, about 4 miles from the junction, subdivides into the South and West Forks. The total length of the main river and branches is about 20 miles. There are along the main channels of these improved stretches 22 miles of wharves and about 7 miles in slips. The river, including its branches between Belmont Avenue in the North Branch and the stockyards in the South Fork of the South Branch, is spanned by 54 bridges, viz., 12

swing bridges, 40 bascules, and 2 lift bridges, including those now under construction and those at the respective boundaries. These bridges consist of 9 railroad, 40 highway, 1 elevated railway, 2 combined highway and railroad, and 2 combined highway and elevated railroad bridges.

There are 4 bridges named in the table published below which do not now exist, No. 6 having been authorized, but with no work yet begun, and Nos. 52, 68, and 87 having been removed and not yet replaced by new ones. There are three tunnels under the river, with their tops submerged 26 feet, one at La Salle Street, one at Washington Street, and one at Van Buren Street.

Main river.—Soundings in the main river taken in December, 1919, revealed channel depths upward of 21 feet over widths varying from 100 to 300 feet.

South Branch.—From Lake Street to Ashland Avenue on the South Branch the mid-channel depth is generally 26 feet for a width of 100 feet, sloping to 16 feet at the docks, which are 200 feet apart where improved, with the exception that in some of the bridge draws the depths vary from 22 to 24 feet and the widths from 90 to 190 feet. No recent examination has been made in the South Branch, but it is believed that material shoaling is prevented by the inward current.

South Branch turning basin, located east of Ashland Avenue at the junction of the South and West Forks of the South Branch, has a least diameter of 174 yards and depths of from 17 to 19 feet in the westerly portion, where shoaling has occurred since the 1912 dredging. There is, however, a 22-foot channel from the South Branch to the West Fork at Ashland Avenue bridge, and a 20-foot passage from the same point to the South Fork.

West Fork, South Branch.—From Ashland Avenue to Robey Street (at the entrance to Sanitary District Canal) the depth is 20 to 26 feet and the minimum width 200 feet. West of Robey Street (northerly side of channel) the depth is 11 to 12 feet for a width of about 80 feet, to a point 332 yards east of South Western Avenue; thence to Forty-eighth Avenue, from 2 to 8 feet.

South Fork, South Branch.—From the South Branch turning basin southward there is an available channel 21 feet deep, with width of about 40 to 60 feet in the northerly end and from 90 to 130 feet in the southerly end, down to the stockyards, except in the East Arm to Racine Avenue, where the depth is only about 19 feet.

The East and West Arms of the South Fork were 20 feet in depth in the former arm and 18 feet in the latter as far as Ashland Avenue, and 13½ feet above that street. In 1916 the Sanitary District constructed an intercepting sewer along the south bank of the West Arm from Ashland Avenue to Robey Street. This portion of the West Arm has been filled up and abandoned as an open waterway.

North Branch.—The latest soundings were taken in November, 1919, from the Chicago & North Western Railway bridge at Kinzie Street to North Avenue. From the bridge to the south entrance to the North Branch Canal the mid-channel depths were greater than 21 feet for widths varying from 50 to 150 feet. Between the south entrance of the canal and the North Branch turning basin the mid-channel depth was generally greater than 20 feet. From the turning basin at North Avenue to Diversey Boulevard the mid-channel depth was about 18 feet in 1917. No soundings have been taken above Diversey Boulevard since 1915. At that time the controlling depth to a point about 200 yards above North Western Avenue was about 19 feet, and thence to Belmont Avenue about 14 feet. It is very probable that considerable shoaling has occurred since the last soundings, owing to numerous sewers and the soft material of the bottom.

The Sanitary District has straightened the channel of the North Branch for 2 miles northward from Belmont Avenue, providing 12 feet depth and 90 feet width to the north side of Lawrence Avenue; the channel connects with Lake Michigan by a 16-foot conduit along Lawrence Avenue. In 1917 North Branch was dredged from Belmont Avenue to Roscoe Street to a depth of 15 feet for a width of about 20 feet in mid-channel; also a turning basin along the west dock north of Roscoe Street, about 500 feet long, 50 feet wide, and 15 feet deep. North of Belmont Avenue, to and including Lawrence Avenue, the channel is crossed by 6 fixed bridges (described later).

North Branch Canal is about 1.04 miles long, its width from the south end to North Halsted Street being about 70 feet, and thence northward to the junction with the river at North Avenue about 110 feet, the width between docks being about 140 feet. Soundings taken in 1919 indicated a least mid-channel depth of about 20 feet. Shoaler water will generally be found along the docks.

North Branch turning basin, located just below North Avenue Bridge, has a least diameter of 173 yards and depths generally greater than 17½ feet. The basin has concrete docks along the west, north, and east boundaries.

North Shore (Wilmette) Channel.—There is a channel between the North Branch at Lawrence Avenue and Lake Michigan in the village of Wilmette. This channel is about 8½ miles long, from 11 to 13½ feet deep, and about 80 feet wide at the water line; it is crossed by 24 fixed bridges, described in the table below.

About 400 feet southwest from the lake at Wilmette is a lock with 3 feet lift and depth of 11 feet over the miter sill; it is 30 feet wide and 43 yards long, but will not be available to navigators.

At Wilmette is a protected harbor of about 6 acres, with a depth of 3 feet on the bar at the entrance; during 1920 it was dredged to a

depth of 12 feet throughout. Its entrance is about 14 miles north by west from the Chicago Harbor entrance. Speed limit in the harbor and channel is controlled by the Sanitary District.

Light.—A fixed red light, 40 feet above water, visible 5 miles, is shown from a red pole on the end of the north pier at the entrance to the Wilmette Sanitary Channel.

Bridges across Chicago River and its branches.

No.	Location and name.	Kind.	Miles from east end of north pier.	Draw openings—clear width.			Clear height above low-water datum.	Remarks.
				Right. ¹	Left. ¹	Center.		
	MAIN RIVER.			<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	
	East end north pier.....		0					
	Ogden Slip.....		0.22					
1	Michigan Avenue.....	Highway.	0.84			220	17.3	Bascule, double deck.
2	Rush Street.....	do.	0.87	73	72		16.8	Swing; to be removed on completion of above.
3	State Street.....	do.	1.07			140	16.8	Bascule.
4	Dearborn Street.....	do.	1.15			140	17.6	Do.
5	Clark Street.....	do.	1.23	67	67.8		17.3	Swing.
6	La Salle Street.....	do.	1.30			200	16.8	Bascule authorized.
	Do.....	Tunnel.	1.30					Lowered to 26 feet depth.
7	Wells Street.....	Highway and Elevated Ry.	1.35	71.2	65		17.3	Swing; double deck; bascule being built.
8	Franklin-Orleans Street...	Highway.	1.43			210	16.8	Bascule.
	SOUTH BRANCH.		1.58					
9	Lake Street.....	Highway and Elevated Ry.	1.62			209.2	16.8	Double-deck bascule.
10	Randolph Street.....	Highway.	1.71			140	17	Bascule.
11	Washington Street.....	do.	1.79			160	20.4	Do.
	Do.....	Tunnel.	1.79					Lowered to 26 feet depth.
12	Madison Street.....	Highway.	1.91	52	55		17.5	Swing; bascule authorized.
13	Monroe Street.....	do.	2.00			165.5	16.8	Bascule.
14	Adams Street.....	do.	2.06	77	58		22.1	See Note 1.
15	Jackson Boulevard.....	do.	2.15			140	16.8	Bascule.
16	Metropolitan Elevated Ry.	Railway	2.18			91.8	34.4	Bascule; removal ordered.
	Van Buren Street.....	Tunnel.	2.20					Lowered to 26 feet depth.
17	Do.....	Highway.	2.24			93.5	16.8	Bascule; removal ordered.
18	Harrison Street.....	do.	2.41			140	16.8	Bascule.
19	Polk Street.....	do.	2.58			140	16.8	Do.
20	Taylor Street.....	do.	2.74			114.4	24.3	Do.
21	Baltimore & Ohio Chicago Terminal R. R.	Railway.	2.81			120	5	Do.
22	Roosevelt Road (Twelfth Street).	Highway.	2.91	61.3	53.5		21.1	Swing, ordered removed; bascule authorized.
23	Chicago, Burlington & Quincy and Illinois Central R. R. (St. Charles Air Line).	Railway	3.46	59.6	57.2		14.9	Swing, to be removed; bascule completed.
24	Eighteenth Street.....	Highway.	3.68			140	21	Bascule.
25	Pittsburgh, Fort Wayne & Chicago R. R.	Railway	3.86			189	9.3	See Note 2.

¹ Right and left refer to sides when going toward the lake.

Bridges across Chicago River and its branches—Continued.

No.	Location and name.	Kind.	Miles from east end of north pier.	Draw openings—clear width.			Clear height above low-water datum.	Remarks.
				Right.	Left.	Center.		
SOUTH BRANCH—contd.								
26	Canal Street.....	High-way.	3.96	Feet.	Feet.	Feet.	Feet.	Bascule.
27	Twenty-second Street.....	do.	4.13			140	16.8	Do.
28	South Halsted Street.....	do.	4.56			95	15.8	See Note 3.
29	Throop Street.....	do.	5.17			140	16.8	Bascule.
30	Loomis Street.....	do.	5.40			140	16.8	Do.
	Turning basin.....		5.53					
WEST FORK OF SOUTH BRANCH.								
31	Ashland Avenue.....	High-way.	5.66			140	16.3	Bascule.
	Chicago Drainage Canal.....		6.25					
32	Leavitt Street.....	High-way.	6.58			50	14.5	Trestle.
33	South Western Avenue.....	do.	6.72	(1)	80		16.8	Swing.
34	Chicago & North Western R. Ry.	Railway	6.85	(1)	80.3		9.1	Bascule.
35	Pittsburgh, Cincinnati, Chicago & St. Louis R. Ry.	do.	6.88	(1)	50.9		7.1	Swing.
36	Illinois Northern R. Ry.	do.	6.90			* 25.5	13	Trestle.
37	Marshall Boulevard.....	High-way.	7.23	(1)	50		12.4	Swing.
38	California Avenue.....	do.	7.24			41	11.6	Temporary trestle.
39	City, temporary trestle.....	Railway	7.43			* 16	10.1	Two spans, each 16 feet.
40	Sacramento Avenue.....	High-way.	7.56			* 12.5	13.3	Concrete.
41	Thirty-first Street.....	do.	7.70			70	16.3	Steel truss authorized.
42	Chicago & Illinois Western R. R.	Railway	7.79			* 12.6	7.3	Trestle authorized.
43	Kedzie Avenue.....	Highway	7.88			41	8.6	Girder.
44	Illinois Northern (A., T. & S. F.) R. Ry.	Railway	8.40			13	13.3	Trestle.
45	South Lawndale Avenue.....	Highway	8.59			* 35	2	Fixed truss. Trestle authorized.
46	Illinois Central R. R.....	Railway	8.66			12	13.3	Trestle.
47	Chicago & Illinois Western R. R.	do.	8.71			13	12.3	Do.
48	South Fortieth (Crawford) Avenue.	Highway	8.98			41	11.6	Girder.
49	Belt R. y. of Chicago.....	Railway	9.87			10	14.3	Trestle; double track.
50	Chicago & Illinois Western R. R.	do.	10.12			12.8	12.6	Trestle.
51	Forty-eighth Avenue.....	Highway	10.13			70	11.1	Fixed truss.
SOUTH FORK OF SOUTH BRANCH.								
52	Fuller Street.....		5.68					Removed. See Note 4.
53	Chicago & Alton R. R.....	Railway	5.88			100	16.8	Bascule.
54	Archer Avenue.....	Highway	5.97			100	16.1	Do.
55	Thirty-fifth Street.....	do.	6.64			120	12.9	Do.
WEST ARM OF SOUTH FORK OF SOUTH BRANCH.								
56	Chicago Junction R. y. (Iron Street).	Railway and high-way.	7.05	57	70		8.3	Swing.
57	South Ashland Avenue.....	Bulkhead	7.50					End of West Arm.
EAST ARM OF SOUTH FORK OF SOUTH BRANCH.								
58	Chicago Junction R. y. (Center Avenue).	Railway and high-way.	7.14	59	53		8.3	Swing.
59	Morgan Street.....	Highway	7.55	52.1	(1)		10.6	Do.

(1) Not available.

* Between bents.

Bridges across Chicago River and its branches—Continued.

No.	Location and name.	Kind.	Miles from east end of north pier.	Draw openings—clear width.			Clear height above low-water datum.	Remarks.
				Right.	Left.	Center.		
NORTH BRANCH.								
				<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	
60	Chicago & North Western Ry.	Railway	1.76			100	5.3	Bascule.
61	Kinzie Street	Highway	1.79			90	12.1	Do.
62	Chicago, Milwaukee & St. Paul Ry.	Railway	1.84	99			5.3	Bobtail swing.
63	Grand Avenue	Highway	1.96			140	16.8	Bascule.
64	Erle Street	do.	2.21			140	16.8	Do.
65	Chicago Avenue	do.	2.40			155	16.8	Do.
	North Branch Canal (south entrance).		2.50					
66	North Halsted Street	Highway	2.64			101	23.6	Do.
67	Division Street	do.	3.28			100	16.8	Do.
68	Blackhawk Street		3.53					Removed. See Note 4.
	Turning basin		3.67					
	North Branch Canal (north entrance).		3.79					
69	North Avenue	Highway	3.80			128	17.3	Bascule.
70	Chicago, Milwaukee & St. Paul Ry.	Railway	4.38	81.4			8.5	Bobtail swing.
71	Courtland Place	Highway	4.48			97	16.8	Bascule.
72	Webster Avenue	do.	4.85			128	16.8	Do.
73	Chicago & North Western Ry.	Railway	5.00			145	16.8	Do.
74	Fullerton Avenue	Highway	5.30	53.6	55		16.3	Swing.
75	Diversey Boulevard	do.	5.98	54	52		16.3	Do.
76	North Western Avenue	do.	6.37			100	16.8	Bascule.
77	Belmont Avenue	do.	6.72			75	16.8	Do.
78	Addison Street	do.	7.29			68	17.7	Fixed truss.
79	Irving Park Boulevard	do.	7.80			75	16.8	Fixed girder.
80	Montrose Avenue	do.	8.31			75	16.8	Do.
81	Wilson Avenue	do.	8.57			70	16.8	Do.
82	Northwestern Elevated Ry	Railway	8.74			41	18.1	Do.
83	Lawrence Avenue	Highway	8.90			72.4	17.6	Fixed girder being built.
84	do.	do.	8.94			75	16.9	Fixed truss; temporary.
NORTH BRANCH CANAL.								
	South end and river		2.50					
85	North Halsted Street	Highway	2.80			90	14.3	Bascule.
86	Division Street	do.	2.95			80	17.4	Do.
87	Weed Street	do.	3.41					Removed. See Note 4.
88	Chicago, Milwaukee & St. Paul Ry.	Railway	3.50	117.7			7.6	Bobtail swing.
	North end, river, and turning basin.		3.54					
NORTH SHORE CHANNEL.								
89	Argyle Street	Highway	9.19			60	16.3	Fixed truss.
90	Foster Avenue	do.	9.46			60	16.3	Fixed girder.
91	Bryn Mawr Avenue	do.	9.96			60	16.3	Fixed truss.
92	Peterson Avenue	do.	10.47			60	16.3	Fixed girder.
93	Lincoln Avenue	do.	10.50			60	16.3	Do.
94	Devon Avenue	do.	11.34			60	16.3	Fixed truss.
95	Touhy Avenue	do.	11.97			60	16.3	Do.
96	Howard Avenue	do.	12.46			60	16.3	Do.
97	Chicago & North Western Ry.	Railway	12.86			60	16.3	Fixed girder.
98	Oakton Avenue	Highway	13.02			60	16.3	Fixed truss.
99	Main Street	do.	13.48			60	16.3	Do.
100	Dempster Street	do.	13.96			60	16.3	Do.
101	Church Street	do.	14.46			60	16.8	Do.
102	Emerson Street	do.	14.96			60	16.3	Fixed girder.
103	Brown Avenue	do.	15.22			60	16.3	Do.
104	West Railroad Avenue	do.	15.60			60	16.3	Do.
105	Chicago & North Western Ry.	Railway	15.62			60	16.3	Do.
106	Lincoln Street	Highway	15.97			60	16.3	Do.

¹ Between pile clumps.² Vertical clearance of all bridges across North Shore Channel is 16.3 feet above normal water surface with lake at low-water datum.

Bridges across Chicago River and its branches—Continued.

No.	Location and name.	Kind.	Miles from east end of north pier.	Draw openings—clear width.			Clear height above low-water datum.	Remarks.
				Right.	Left.	Center.		
	NORTH SHORE CHANNEL—continued.			<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	
107	Center Street.....	Highway	16.16	.....	.....	60	16.3	Fixed girder.
108	Chicago, Milwaukee & St. Paul Ry.	Railway	16.28	.....	.....	60	16.3	Fixed truss.
109	Isabella Street.....	Highway	16.45	.....	.....	60	16.3	Fixed girder.
110	Hill Street.....	do.	16.62	.....	.....	60	16.3	Do.
111	Linden Avenue.....	do.	16.77	.....	.....	60	16.3	Do.
112	Sheridan Road (crossing lock).	do.	16.94	.....	.....	30	16.3	Do.

Whistle signal for opening draws, 3 short (— — —), except that 4 short (— — — —) are sounded for the Chicago & N.W. Ry. bridge at Kinzie Street and for the C., M. & St. P. Ry. bridge at North Avenue when going either way, and 5 short (— — — — —) when approaching Lake Street bridge from the north. A red flag or a red lantern is waved when bridge can not be opened and is displayed until bridge can be opened. Bridges remain closed during hours as specified in paragraph 1107 of Regulations.

NOTE 1.—Swing bridge; west or left draw made available by removal of by-pass, but only for short boats on account of obstructions above.

NOTE 2.—Vertical lift, with clearance, when up, of 120 feet.

NOTE 3.—Vertical lift, with clearance, when up, of 157 feet.

NOTE 4.—Old bridge has been removed, but is expected to be superseded sooner or later.

Local regulations for the control of navigation in Chicago Harbor are published by the local authorities. Mariners should obtain a copy of these regulations and carefully comply with them.

Chicago Sanitary and Ship Canal, Ill.—The main channel connects with the West Fork of the South Branch of the Chicago River at Robey Street, $6\frac{1}{2}$ miles from the outer end of the north pier at the mouth of the river. The channel depths in this stretch of the river are from 19 to 26 feet.

Dimensions.—The main channel of the Sanitary Canal extends from the Chicago River at Robey Street to the Illinois and Michigan Canal Basin in the Des Plaines River at Joliet, a distance of 32.35 miles, and has dimensions as follows:

Robey Street to Summit, 7.8 miles, 162 feet wide at bottom and 226 feet at water line. Summit to Willow Springs, 5.3 miles, 202 feet wide at bottom and 290 feet at water line. Rock section, Willow Springs to the controlling works at Lockport, 14.95 miles, 160 feet wide at bottom and 162 feet at water line. At the controlling works there is a fan-shaped basin with an extreme width of 502 feet. From these works to the lock at the power plant between Lockport and Joliet, 2 miles, the channel is of irregular width, nowhere less than 160 feet. The lock, which was opened to navigation July 13, 1910, is 130 feet long and 22 feet wide, with 12 feet of water over the miter sill; mean lift, about 36 feet. From the lock to the Illinois and Michigan Canal Basin at Joliet, 2.3 miles, through rock, 160 feet wide at bottom and 162 feet wide at top.

The depth in the Sanitary Canal is generally 22 to 26 feet, except from the lock to the Illinois and Michigan Canal Basin, where a minimum depth of 10 feet is maintained. The current is figured at 1.25 miles per hour through earth banks and 1.9 miles per hour through masonry.

Bridges.—The canal is crossed by the bridges described in the table below. All the bridges are swing bridges, except No. 2, which has a bascule draw across the center span and one fixed span on each side; No. 16, which is a fixed span with one opening; and No. 18, which is a fixed bridge with three openings each 42 feet wide, and they are so built that they can be operated; however, the motive power is lacking at all the bridges except Nos. 14 and 15, which are in commission, and No. 2, which is not in commission but can be operated.

The law permitted the Sanitary District to keep the bridges closed as fixed structures for a period of nine years dated from January 17, 1900, after which they were to go into service as movable bridges. The above provision has not yet been complied with, but when completed the canal will be available as a free waterway.

Bridges across Chicago Sanitary and Ship Canal.

No.	Location and name.	Kind.	Miles from east end of north pier.	Draw openings—clear width providing 15 feet depth.			Clear height above low-water datum.	Remarks.
				Right. ¹	Left. ¹	Center.		
				Feet.	Feet.	Feet.	Feet.	
1	Western Avenue Boulevard and South Western Avenue.	Highway	6.75	77	77	.....	16.7	Swing.
2	Baltimore & Ohio, Chicago Junction, and Pittsburgh, Cincinnati, Chicago & St. Louis Railways.	Railway	6.89	.....	.....	120	16.3	Bascule.
3	Chicago, Madison & Northern (Illinois Central) R. R.	.....do.....	7.72	58	88	.....	18.8	Swing.
4	Kedzie Avenue.....	Highway	7.85	63	79	.....	16.8	Do.
5	Atchison, Topeka & Santa Fe Ry.	Railway.	8.39	75	75	.....	17.8	Do.
6	Chicago & Western Indiana R. R.	.....do.....	9.93	.....	88	.....	16.9	Swing. See Note 1.
7	Atchison, Topeka & Santa Fe Ry.	.....do.....	12.68	63	91	.....	18.5	Swing.
8	Summit—Lyons.....	Highway	14.30	70	60	.....	18.3	Swing. See Note 2.
9	Baltimore & Ohio, Chicago Terminal R. R.	Railway.	15.27	53	63	.....	18	Do.
10	Willow Springs.....	Highway	15.88	.....	.....	162	18.1	Bobtail.
11	Atchison, Topeka & Santa Fe Ry., Lemont.	Railway.	26.97	.....	.....	162	17.6	Do.
12	Lemont Road.....	Highway	27.03	.....	.....	162	17.1	Do.
13	Romeo Road.....	.....do.....	31.40	.....	.....	162	16.6	Do.
14	Lockport—Ninth Street.....	.....do.....	34.75	(²)	160	.....	4.8	Do.
15	Lockport—Sixteenth Street.	.....do.....	35.29	(²)	160	.....	4.8	Do.
	Lock.....	.....	36.30	.....	.....	.....		Described above.
16	At Lock.....	Foot.....	36.30	.....	.....	40	18	Fixed.
17	Sanitary District Spur.....	Railway.	36.31	.....	42	.....	6	Swing.
18	Elgin, Joliet & Eastern Ry.	.....do.....	37.30	40	40	40	25	Fixed; 3 openings.

¹ Going in a southwesterly direction (from the lake).

² Not available.

³ Above mean water surface.

NOTE 1.—The bridge is built for two draws, but only one (the left) has been dredged and made available as yet.

NOTE 2.—Both draws are available for boats that can pass under the bridge.

Butterfly Dam—Just below the controlling works at Lockport is a butterfly dam, swinging on center pivots located in midstream, and having an 80-foot channel width on each side of it when open. Navigators are cautioned to look out for this structure. The dam is normally open, and is solely a safety device, providing a method of stopping the flow of water in the event of an accident to the levee walls or water-power development works 2 miles below.

Chicago to the Mississippi River.—The distance from Lake Michigan to the Mississippi River by way of the Chicago River, the Sanitary and Ship Canal (above described), the Illinois and Michigan Canal, and the Illinois River is 352.82 miles, made up as follows:

	Miles.
Chicago River from end of north pier to Robey Street.....	6.25
Sanitary Canal, Robey Street to Junction with Illinois and Michigan Canal at Joliet.....	32.35
Illinois and Michigan Canal, Joliet to Illinois River at La Salle.....	64.02
Illinois River, La Salle to mouth at Grafton.....	223.20
Total	325.82

The Illinois and Michigan Canal formerly commenced on the South Branch of the Chicago River 5.70 miles from the end of the north pier at the mouth of the river, its total length thence to its junction with the Illinois River at La Salle being 95.82 miles. The canal was intended to be 60 feet wide at the water surface, 40 feet wide on the bottom, with locks 105 feet long, 18 feet wide, and having a depth of 6 feet on the miter sills. There were 15 lift locks and one guard lock.

By a law effective July 1, 1917, the canal is now under the jurisdiction of the State department of public works and buildings, division of waterways, which has supervision over all waterways of the State except the Sanitary District of Chicago.

As a result of the connection established (as noted under the preceding head) between the Sanitary Canal and the Illinois and Michigan Canal, the portion of the latter between the Chicago River and Joliet is not used for navigation. All boats (subject to bridge headroom) now use the Sanitary Canal and lock to the above-mentioned connection.

Bridges across Illinois River between Peru and the mouth.

No.	Location and name.	Kind.	Miles from east end of north pier, Chicago.	Draw openings—clear width.			Remarks.
				Right.	Left.	Center.	
				<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	
1	Peru.....	Wagon..	101.37	130	123	.....
2	Spring Valley.....	do.....	105.32	136	136	.....
3	Marquette, New York Central R. R.	Railway..	109.88	162	162	.....	1 mile below Marquette.
4	Henry.....	Wagon..	127.75	124	124	.....	Right for lock. Left for boats passing dam.
5	Lacon.....	do.....	134.62	.....	.....	150	Pontoon.
6	Chillicothe, Atchison, Topeka & Santa Fe Ry.	Railway..	136.94	(¹)	128	.....	1 mile above the city.
7	Peoria, upper highway.....	Wagon..	157.67	131	131	.....	Swing. At the narrows.
8	Peoria, Bridge Street.....	do.....	161.46	.....	.....	125	Bascule.
9	Peoria, Toledo, Peoria & Western Ry.	Railway..	161.52	(¹)	118	.....	Swing. Adjacent to above.
10	Peoria, Street Ry.....	do.....	161.56	.....	.....	125	Bascule.
11	Peoria, Peoria & Pekin Union Ry.	do.....	162.86	.....	.....	140	Bascule. total span 160 feet.
12	Pekin, Peoria & Pekin Union Ry. ¹	do.....	170.74	.....	.....	250	
13	Pekin, Peoria Railroad Terminal.	do.....	170.75	165	(¹)	.....
14	Pekin.....	Wagon..	170.84	(¹)	110	.....
15	St. Louis, Peoria & Northwestern (Chicago & North Western) Ry.	Railway..	172.44	.....	.....	150	Lift span.
16	Havana, Chicago, Peoria & St. Louis R. R. ²	do.....	203.47	155	155	.....	Upper end of city.
17	Havana.....	Wagon..	203.75	120	120	.....	Swing.
18	Havana, Illinois Central R. R. ¹	Railway..	204.09	120	120	.....	See Note 1.
19	Beardstown, Chicago, Burlington & Quincy R. R.	do.....	234.96	118	118	.....	Swing.
20	Beardstown.....	Wagon..	235.16	125	125	.....	Do.
21	Meredosia, Wabash R. R.....	Railway..	252.75	125	125	.....	Swing. Left draw not available in low water.
22	Valley City, Wabash R. R.....	do.....	262.16	131	131	.....	Swing.
23	Pearl, Chicago & Alton R. R.....	do.....	280.60	133	133	.....	Do.

¹ Not available.² Piers only.

All bridges are lighted in accordance with the regulations of the Lighthouse Bureau. Right and left hand refer to sides going downstream.

NOTE 1.—At lower end of city. Pivot and east draw pier have been removed to depth of 7 feet at low water and will be removed 2 feet deeper; clearance between remaining piers, 325 feet.

Illinois and Mississippi Canal.—This canal connects with the Illinois River at a point 2.75 miles above Hennepin and 13 miles below the Illinois and Michigan Canal outlet at La Salle, and extends thence in a westerly direction via Bureau Creek Valley and over the summit to Rock River at the mouth of Green River; thence in the bed of Rock River to the rapids near Milan, Ill., and thence by canal around the lower rapids to the Mississippi River at the mouth of Rock River; total length of main line, about 75 miles. The feeder extends from Rock River at Rock Falls, Ill., about 29 miles southward, meeting the main line in mile 28. At low water the summit level is 196 feet above the Illinois River and 93 feet above the Mississippi River.

The canal has a minimum width of 80 feet at the water surface and is 7 feet deep, with locks 170 feet long between quoins and 35 feet

wide, capable of passing barges of not over 140 feet length, 34 feet beam, and 840 tons gross tonnage. Water is supplied from Rock River and controlled by a guard lock at Rock Falls. There are in operation 34 locks, built of concrete, with lifts of from 6 to 12 feet each, including a new lock giving access to the town of Sterling, which was placed in operation in 1913. The canal further includes 67 highway bridges, 8 railroad bridges, 2 pontoon bridges, 1 farm bridge, 9 aqueducts lined with reinforced concrete, 62 culverts, 3 dams, 34 sluice gates, lockhouses, etc. The bridges have a clear height above the water surface of 17 feet on the main line and on the lower part of the feeder, and of 12 feet on the upper part of the feeder.

Rules and regulations governing this canal may be obtained from the United States Engineer Office, Rock Island, Ill. The same office also sells charts of the canal at 10 cents apiece.

Evanston Waterworks.—Water supply intakes are located about 1 mile east from the shore about 233 yards southerly from Grossepoint Light, in 27 feet of water and with the top of the work about 19 feet below the water surface.

Buoys.—Five horizontally striped red and black spar buoys, maintained by the city of Evanston, mark the intake system at the following points, located east from the shore line at the pumping station: East intake strainer buoy, about 1 mile; half-mile buoy, on north side of junction of intake pipes, about 923 yards; pipe junction buoy, on south side of junction of intake pipes, opposite the preceding buoy; intake tee buoy, on south side of pipes, about 627 yards; intake tee buoy, on north side of pipes, distant about 433 yards.

A Coast Guard station is located about 1 mile south of Grossepoint Light, on the Northwestern University grounds at Evanston.

Grossepoint.—A shoal bank extends $1\frac{1}{2}$ miles to the eastward from the shore immediately north of the lighthouse, and there is shallow water for a like distance offshore for $2\frac{1}{2}$ miles north of the lighthouse. The outermost limit of the foul area at this locality is a detached 22-foot spot $2\frac{1}{4}$ miles 61° (NE. by E. $\frac{1}{4}$ E.) from the lighthouse.

Light.—An alternating fixed white and flashing red light, 119 feet above water, visible 20 miles, is shown from a white conical tower, on Grossepoint.

Fog signal.—The fog signal is made on a steam whistle.

Buoy.—A red spar buoy marks the 22-foot shoal $2\frac{1}{4}$ miles north-eastward of the point. Mariners are cautioned to keep well eastward of this buoy.

Coast.—From Grossepoint the coast trends northwest then north to Waukegan, 22 miles from Grossepoint; the shore is low and wooded with deep water generally 1 mile from it, but with some outlying shoals.

Off Glencoe, Ill., is a ridge of solid ledge rock, about 333 yards long northeast and southwest and 67 yards wide; a depth of 9 feet exists near the northeast end of the shoal, located $6\frac{3}{4}$ miles 333° (NNW. $\frac{3}{4}$ W.) from Grossepoint Lighthouse and 1 mile offshore.

A rock shoal about 167 yards in diameter, with least depth of about 12 feet, is located about 9 miles 329° (NNW. $\frac{3}{4}$ W.) from Grossepoint Lighthouse and 1,167 yards from shore. A rock shoal about 335 yards in diameter, on which the least depth found was about 23 feet, is located about 9 miles 348° (N. by W. $\frac{3}{4}$ W.) from Grossepoint Lighthouse and $3\frac{3}{4}$ miles from shore.

The Great Lakes Naval Training Station intake crib is about 633 yards offshore and 3.3 miles 191° (S. $\frac{3}{4}$ W.) from Waukegan Harbor Light.

A radio station at Great Lakes is operated all the year by the United States Navy; call letters NAJ; working distance 1,000 miles. Radio time signals are transmitted daily, except Sundays and holidays, at 10.55 to 11 a. m., standard time, 90th meridian.

Waukegan Harbor, Ill.—An artificial harbor, about 34 miles from the entrance to Chicago River, and about 46 miles from the entrance to the harbor at Milwaukee. North and south of the harbor the lake shore, for a distance of several miles, is composed of sand and has an elevation of but a few feet above the lake. At about 500 yards westward the plateau upon which the city of Waukegan is chiefly built has an elevation of from 50 to 80 feet.

Light.—An alternating fixed white and group flashing red light, 36 feet above water, visible 13 miles, is shown from a white cylindrical tower attached to a building on the outer end of the south pier.

Fog signal.—The fog signal is made on a steam whistle.

Breakwater and piers.—The breakwater extends 196 yards northwest from its outer end, which is 367 yards 73° (ENE. $\frac{1}{4}$ E.) from the north pierhead. It does not afford anchorage ground or mooring facilities for vessels, but protects the harbor somewhat from the injurious effects of northeast seas.

The north pier is 537 yards long and extends about due east approximately normal to and about 317 yards beyond the shore line. Connecting with the inner end of the north pier the east revetment of the interior basin extends 207 yards 317° (NW.), then 89 yards 1° (N. $\frac{1}{4}$ W.). The south pier is 1,069 yards long and 80 yards from the north pier, its outer end being 967 yards beyond the shore line and 145 yards 126° (SE. by E.) from the north pierhead; then it extends due west 720 yards and then 349 yards 244° (SW. by W. $\frac{1}{4}$ W.) to the shore. Owing to heavy littoral drift of sand from north to south the shore line on the north side of the piers is 567 yards in advance of that on the south side.

Light.—A flashing red light, 31 feet above water, visible 6 miles, is shown from a red hexagonal pyramid on the southeast end of the breakwater.

Channel and basin.—The entrance channel is about 667 yards long and 67 yards wide, extending due west from deep water in the lake to the interior basin. The basin contains about 14 acres and is 327 yards long north and south, measuring from the stub of the old shore end of the south pier, with width of about 133 yards at its north end, increasing to about 267 yards in line with the entrance channel. The interior basin does not afford anchorage ground, but vessels can moor to the revetment on the west side and also in the slips to the northward. During severe storms vessels are sometimes required to moor in the middle of the slips and away from the docks to prevent damage to vessels and revetments.

Extensive annual dredging for maintenance of the project depth is necessary. In May, 1920, there was a depth of 18 feet in the basin and for a width of 180 feet in the channel between the piers.

Connecting with the interior basin a private channel having a depth of from 18 to 12 feet and a minimum width of 67 yards extends 333 yards 15° (N. by E. $\frac{1}{2}$ E.). Two slips branch off this channel in a northwesterly direction, each 125 feet wide; the more southerly slip is about 267 yards long and 18 feet deep and the northerly one is about 175 yards long and 12 feet deep.

Shoals in approach to harbor.—A foul area comprising a number of detached rocky spots exists to the eastward of the harbor entrance. Measuring from Waukegan Harbor Light on the end of the south pier the inner and most westerly spot, with $18\frac{1}{2}$ feet depth, lies 1,000 yards 99° (E. $\frac{1}{4}$ S.); the spot of least depth, $16\frac{1}{2}$ feet, lies 1,233 yards 91° (E. $\frac{1}{4}$ N.); the most northerly spot, with $19\frac{1}{2}$ feet, lies 1,367 yards 88° (E. $\frac{3}{4}$ N.); and the most easterly and southerly spot, having $18\frac{1}{2}$ feet, lies 104° (ESE. $\frac{1}{4}$ E.), with a spot of the same depth about 133 yards northwest of it.

Light buoy.—A black spar-shaped buoy, showing an occulting white light, is moored in 28 feet near the most northerly shoal spot. A spar buoy is moored close alongside the light buoy.

Caution.—Vessels should keep to northward of the light buoy.

Buoy.—A black spar buoy marks the easterly side of the shoal area.

A stake in 21 feet of water, with $14\frac{1}{2}$ feet depth over it, was found by the Lake Survey in 1911 at a point 167 yards 52° (NE. $\frac{1}{2}$ E.) from Waukegan Breakwater Light.

Rules and Regulations for Waukegan Harbor, approved by the Secretary of War:

All vessels or craft are forbidden to tie to or lie alongside of the United States harbor piers at Waukegan, Ill., except they are en-

gaged on Government business, or are compelled by stress of weather or accident, or to prevent loss of life or property. They are likewise forbidden to lie at anchor in the basin or channel of said harbor, except for refuge from storms, or in any way to obstruct free navigation of said harbor.

City.—The city is a popular summer and health resort and its mineral waters are extensively used. It has a population of 19,226 (1920).

The manufacturing industries are varied, consisting of sugar refineries, steel-wire and brass works, tanneries, pianos, and organs. The city is an outlet for a large farming and stock-raising region.

Coast.—From Waukegan the coast trends generally due north for $16\frac{1}{2}$ miles to Kenosha, Wis. The Illinois-Wisconsin boundary line is about $9\frac{1}{2}$ miles north of Waukegan. The shoal bank extends from 660 to 1,100 yards offshore. There are no outlying dangers.

Kenosha Harbor, Wis., is located at the mouth of Pike Creek. The sand hill upon which the abandoned lighthouse is situated, about 167 yards from the north pier, has an elevation of about 25 feet above the lake, with a broad, low sand beach sloping to the lake shore. On the south side of the entrance the land is must lower, and warehouses and factories are prominent features near the shore line.

Breakwater and piers.—The breakwater extends 267 yards northwestward from its outer end, which is 234 yards 81° (E. by N.) from the north pierhead. It does not afford anchorage ground or mooring facilities for vessels, but it protects the harbor considerably from the injurious effects of northeast seas.

The north pier is 359 yards long, extending 81° (E. by N.) about normal to and all beyond the shore line. The south pier is 624 yards long, approximately parallel to the north pier, and projects 500 yards beyond the shore line. The clear width between the piers is 83 yards at the entrance and 73 yards near the inner end of the south pier.

Channel and basin.—The entrance channel is about 783 yards long and 67 yards wide, and extends 265° (W. $\frac{1}{2}$ S.) from deep water in the lake to the interior basin. The basin, which is of irregular dimensions and contains about 8 acres, does not afford anchorage ground, but vessels can moor to the revetments which surround it. Severe easterly gales cause considerable disturbance in the basin.

Annual dredging is necessary for maintenance of the depths in both channel and basin. In July, 1920, there was a depth of 19 feet, with a minimum width of 150 feet.

Connecting with the interior basin on its westerly side opposite the entrance channel, Pike Creek has been dredged by local interests to a depth of 12 feet for a distance of about 883 yards to Grand

Avenue Bridge, above which the depth of the creek is less than 2 feet. From the northwest corner of the basin, a channel having depth of 18 feet extends 319° (NW. $\frac{1}{4}$ N.) about 166 yards to Middle Street Bridge, beyond which the depth in the bayou is less than 4 feet.

Range lights—Front light.—A flashing red light, 35 feet above water, visible 6 miles is shown from a red octagonal frame tower on the southeast end of the breakwater.

Rear light.—A flashing red light, 35 feet above water, visible 14 miles is shown from a red cylindrical tower on the end of the north pier about 250 yards $263^{\circ} 39'$ (W. $\frac{1}{4}$ S.) from the front light.

Fog signal.—The fog signal is made on an air siren.

These lights form a range for approaching the harbor.

Intake buoys.—The waterworks north intake is located in 26 feet of water 875 yards 46° (NE. $\frac{1}{4}$ N.) from the breakwater light; another water intake located 758 yards 81° (E. by N.) from the breakwater light. The intake of the American Brass Co. is located in about 17 feet of water and about 600 yards offshore at a point about 1 mile south of the harbor entrance.

Buoys.—A black spar buoy marks the north intake; a white spar buoy the intake near the breakwater light and a white spar buoy the intake of the American Brass Co.

A Coast Guard station is located on Washington Island, in the harbor.

Storm warnings.—Day and night signals are displayed from the old lighthouse tower about 400 feet north of the entrance.

Anchorage.—In ordinary weather vessels can anchor outside where there is good holding ground.

The city is at the mouth of Pike Creek. It has extensive fisheries and manufactories of typewriters, metal beds, wagons, automobile lamps, organ reeds, etc. The population is 40,472 (1920).

Bridges across Pike Creek at Kenosha.

No.	Location and name.	Kind.	Draw openings— clear width.		Clear height above low- water datum.	Remarks.
			Right. ¹	Left. ¹		
			Feet.	Feet.	Feet.	
1	Main Street.....	Highway	38	70.67	15	See Note. Head of navigation: not lighted. Draws have never been open.
2	Grand Avenue.....	do	53	53	10	
3	Middle Street (over bayou)	do	55	55	10	

¹ Looking downstream toward the lake.

NOTE.—Right draw not accessible. Two lights show red up and down stream when bridge is closed.
Signal for opening draw, 3 long (— — — — —).

City regulations affecting navigators are published by the local authorities. Mariners should obtain a copy of these regulations and carefully comply with them.

Coast.—From Kenosha the coast trends north by east for 10 miles to Racine. With the exception of Racine Reef, it is clear outside of a shoal limit, within the 21-foot curve, extending about 1 mile from shore.

Racine Harbor, Wis., is situated at the mouth of Root River. For a considerable distance north and south of the entrance the lake shore is composed of sand with an elevation of but a few feet above the lake.

Racine Reef is a large shoal with detached spots surrounding, lying with its westerly end about 1 mile southwest of Racine Harbor entrance. The main reef is $1\frac{1}{2}$ miles in extent east and west by 1,320 yards north and south, with least depth of $8\frac{1}{2}$ feet near its center.

Light.—A flashing red light, 12 feet above water, visible 16 miles, is shown from a brown and white octagonal tower on the eastern side of the reef. (See Light List.)

Fog signal.—The fog signal is made on a steam whistle.

Light buoy.—A black cylindrical buoy showing a flashing white light is moored in 19 feet on the western end of the reef.

A spar buoy is moored alongside it.

Breakwaters.—The north breakwater has a total length of 881 yards. Its inner end joins about 67 yards of sewer outfall pier built by the city of Racine about 517 yards north of the entrance channel, and thence it extends 145 yards about east, then 313 yards about east-southeast, and then 423 yards about southeast by south to the harbor entrance.

The south breakwater is 504 yards long, extending south-southwestward from a point 167 yards due south of the outer end of the north breakwater.

The harbor entrance is 167 yards wide and is about 767 yards outside of the shore line. That part of the outer harbor to the northward of the old south pier has an area of about 50 acres, but does not afford anchorage for vessels.

Piers.—The old north pier at the river entrance has been removed except for a length of about 70 feet at the inner end. The south pier is 573 yards long, projecting about 517 yards in an east by north direction beyond the shore line. The clear distance between the stub end of the north pier and the south pier is about 250 feet, and between the shore end of the south pier and the revetment opposite thereto 235 feet. The least width between the docks and revetments below Main Street Bridge is 216 feet.

Channel.—The entrance channel is 767 yards long, bearing in a west by south direction, and has a width of 120 yards at the outer ends of the breakwaters and through the outer basin, narrowing to 200 feet at the inner end between the south pier and the north revetment. In April, 1920, the channel had a depth of 19 feet except for a 17-foot shoal opposite the northern end of the south pierhead.

Connecting with the inner end of the Government Channel, the Root River has been dredged to a depth of 17 feet for 1,000 yards to Fourth Street Bridge, and to a depth of 5 feet for an additional 833 yards to Marquette Street Bridge. For about 1 mile above Marquette Street the natural depth of the river does not exceed 2 feet.

Lights.—A flashing white light, 42 feet above water, visible 10 miles, is shown from a white, pyramidal, skeleton tower on the lake end of the south breakwater.

An occulting red light, 34 feet above water, visible 6 miles, is shown from a red, pyramidal tower, on the lakeward end of the north breakwater.

A fixed red light, 31 feet above the water, is shown from a red post located on the stub end of the north pier.

A fixed white light, 46 feet above water, visible 14 miles, is shown from a white, square, pyramidal tower with the upper half inclosed on the south pier about 100 yards shoreward of the light on the end of the pier.

Fog signal.—The fog signal is made on a bell.

City.—Racine is the second city in the State and has one of the best harbors on the lake. The city is handsomely laid out and contains a number of stately public buildings. It is an important manufacturing city. The population was 58,593 in 1920.

The manufactures consist of agricultural implements, foundry and machine-shop products, boots and shoes, leather goods, and automobiles.

Trade.—The trade of Racine is principally in manufactured articles and farm and dairy products.

A Coast Guard station is located on the north side of the harbor entrance.

Storm warnings.—Day and night signals are displayed from a steel tower on the northwest corner of the coast-guard station.

Bridges across Root River at Racine.

No.	Location and name.	Kind.	Draw openings— clear width.		Clear height above low- water datum.	Remarks.
			Right. ¹	Left. ¹		
			<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	
1	Main Street.....	Highway....	76	79.0	8.3	Low swing bridge. See Note 1.
2	State Street (formerly Second).....	do.....	55	50.0	21.0	See Note 1.
3	Fourth Street.....	do.....	44	38.6	20.0	Do.
4	Chicago, Milwaukee & St. Paul Ry. (St. Clair Street).	Railway....	50	50.0	6.5	See Note 2.
5	Mead Street.....	Highway....	58	58.0	12.0	Not lighted.
6	Sixth Street.....	do.....	57	57.0	16.0	Do.
7	Chicago & North Western Ry. (between Eighth and Ninth Streets).	Railway....	107	107.0	-----	Not lighted. See Note 3.

¹ Looking downstream toward the lake.

Signals for opening draws: Main Street, 2 short blasts (— —); State Street, 3 short blasts (— — —); Fourth and Mead Streets, 4 short blasts (— — — —); railway bridge near St. Clair Street, 5 short blasts (— — — — —).

NOTE 1.—Red light on each end of draw piers; red light at each free end of protection piers; red light on each side of pivot pier; 3 lights on top of draw show red when bridge is closed and green when open.

NOTE 2.—Red light on each side of each draw pier; red light on each end of protection pier; red light on each side of pivot pier; 2 lights on each end of draw span show red when bridge is closed and green when open.

NOTE 3.—Neither draw is accessible, the rails and timbers being continuous across the ends of the draws. The depth would only permit passage of very small vessels.

Regulations to govern the opening of bridges at Racine, Wis., prescribed by the Secretary of War:

THE REGULATIONS.

For the bridges owned and operated by the city of Racine, Wis., across the Root River at Main, State, Fourth, and Mead Streets:

SECTION 1. The draws of the above-named bridges shall be immediately opened for the passage of foreign vessels and "vessels of the United States" as defined by section 4311 of the Revised Statutes, at all times during the day or night except between the hours of 6.30 and 7 a. m., between 12 m. and 12.15 p. m., and between 12.45 and 1 p. m., upon signals to be given by blasts of a horn or steam whistle, as follows: For the Main Street Bridge, two short blasts; State Street Bridge, three short blasts; Fourth and Mead Streets Bridges, four short blasts.

SEC. 2. In case street traffic shall have been delayed by reason of the draws of any of the above-described bridges having been continuously open for five minutes or more for the passage of any of the vessels before described, the draws of said bridges may be closed, but shall be again opened for the passage of said vessels as soon as practicable: *Provided*, That in such case the opening of any of the above-described bridges for the passage of any vessels before de-

scribed shall not be delayed more than five minutes after the proper signal is given.

SEC. 3. The draws shall, when the above-described signals are given, be opened as soon as practicable for all other vessels which can not pass the closed bridges: *Provided, however,* That no vessel of this class shall be delayed for a longer period than 15 minutes.

SEC. 4. In case the draws can not be immediately opened when the signals are given, a red flag or ball by day or a red light at night shall be conspicuously displayed.

For the bridge owned and operated by the Chicago, Milwaukee & St. Paul Railway Co. across the Root River at or near St. Clair Street, within the limits of the city of Racine, Wis.:

SECTION 1. The draw of the above-named bridge shall be immediately opened for the passage of foreign vessels and "vessels of the United States" as defined by section 4311 of the Revised Statutes, at all times during the day or night, upon signal to be given by five short blasts of a horn or steam whistle.

SEC. 2. The draw shall, when the above-described signal is given, be opened as soon as practicable for all other vessels which can not pass the closed bridge: *Provided, however,* That no vessel of this class shall be delayed for a longer period than 15 minutes.

SEC. 3. In case the draw can not be immediately opened when the signal is given, a red flag or ball by day or a red light at night shall be conspicuously displayed.

City regulations controlling navigation in Racine Harbor are published by the local authorities. Mariners should obtain a copy of these regulations and comply with them.

Wind (Racine) Point lies about $3\frac{1}{4}$ miles in a north by east direction from Racine; the coast between curves slightly inward. The shore bank extends about 880 yards offshore.

A detached shoal with 20 feet on it lies $1\frac{1}{4}$ miles north-northeast of Racine pier head light and 1 mile east of the mainland.

Light.—A flashing white light, 111 feet above water, visible 19 miles, is shown from a white conical tower on Wind Point.

Fog signal.—The fog signal is made on an air siren.

Wind Point North Shoals, a rocky reef covered with boulders and having a least depth of $17\frac{1}{2}$ feet, are situated $1\frac{1}{8}$ miles northeast by east from Wind Point Light.

Light buoy.—A red conical buoy, showing an occulting white light, is moored in 22 feet on the southeast end of the shoals.

A red spar buoy is moored alongside the light buoy.

Caution.—All vessels, especially in heavy weather, should keep well outside of the buoy, for while there is deep water inside of it there are also other reefs that would be dangerous.

Wind Point South Shoal lies $1\frac{1}{2}$ miles southeast by east from Wind Point Light and has a least depth of $17\frac{1}{2}$ feet.

Buoy.—A red and black horizontally striped can buoy marks the shoalest part.

Coast.—From Wind Point the coast curves in northwestward for about 12 miles to South Milwaukee and may be approached within 880 yards until abreast Carrollville as there are no outlying shoals on the coast southward of that town. Between Carrollville and South Milwaukee shoals lie nearly 1 mile offshore. A submerged intake crib with 19 feet over it is abreast of Carrollville.

South Milwaukee Harbor, is at the mouth of Oak Creek, about 9 miles to the southward of Milwaukee Harbor. The clay bluffs forming the lake shore to the north and south have an elevation of 60 feet or more above the lake.

The north pier, 262 yards long, and the south pier, 100 yards long, project beyond the shore line 167 yards and 47 yards, respectively; the distance between them is 67 yards.

The channel between the piers runs about eastsoutheast and west-northwestward.

Coast.—From South Milwaukee to the southern approach to Milwaukee Bay the coast trends northward along which there are several outlying and detached shoal spots and it should not be approached within 1 mile.

South Point, the southern limit of Milwaukee Bay has a shoal bank extending $1\frac{1}{2}$ miles notheastward from it.

Buoy.—A black can buoy marks the northeastern extremity of the shoal bank.

Caution.—Vessels of heavy draft should pass northward of this buoy.

Milwaukee Bay.—From South Point the coast makes a deep indentation in the land, about $2\frac{1}{2}$ miles, in the form of a semicircle, and about 5 miles from headland to headland, in a north and south direction, forming a commodious bay.

The 18-foot curve lies about 300 yards off the southwestern shore of the bay and 500 to 800 yards off the western and northwestern shores.

Milwaukee Lightvessel, shows a group occulting white light, 53 feet above water, visible 15 miles. It has a red hull, *Milwaukee* on both sides, and a red cylindrical lantern on a mast. It is anchored in 50 feet, 3 miles, 90° (E. $\frac{1}{2}$ N.) from the front range light Milwaukee Harbor.

Fog signal.—The fog signal is made on a steam whistle. If the whistle is disabled the fog signal will be made on a hand bell.

Milwaukee Harbor—Harbor of refuge.—The breakwater has a total length of about 1.6 miles. Except the southerly 333 yards,

the entire breakwater has concrete superstructure. The general direction of the shore arm of the breakwater for 817 yards is south-southeast; the main arm then runs south by west for 1.2 miles; 382 yards south from the angle there is an opening 167 yards wide for fair weather entrance and exit. The southerly end is located 1,167 yards about northeast by east from the mouth of the Milwaukee River.

The protected area available for the use of vessels is about 275 acres over 16 feet deep, with a maximum depth of 32 feet. The anchorage ground is good. No provision is made for mooring vessels to the breakwater, and such mooring is prohibited, except in the case of harbor tugs.

Lights.—An occulting red light, 50 feet above water, visible 8 miles, is shown from a red rectangular pyramidal tower on the south end of the breakwater.

Piers.—The north pier, about 550 yards long, extends nearly east about normal to and 433 yards beyond the shore line. The south pier, about 537 yards long, extends about east by north and 530 yards beyond the shore line. The width between the piers is 120 yards at the outer end and 183 yards at the shore line. At the shore end a part of the old south pier still remains, leaving the width between the piers 84 yards. The shore end of the new south pier is 91 yards south of the old south pier.

Lights.—A flashing white light, 41 feet above water, visible 8 miles, is shown from a white pyramidal shaft on the south pier.

Range lights—Front light.—A fixed red light, 45 feet above water, visible 10 miles, is shown from a red cylindrical tower on the outer end of the north pier.

Fog signal.—A steam whistle is located at the lighthouse.

Rear light.—A fixed red light, 64 feet above water, visible 8 miles, is shown from a red rectangular pyramidal tower located 183 yards 267° (W. $\frac{1}{2}$ S.) from the front light.

These lights in range mark the direction of the piers.

Entrance channel.—The entrance channel is about 733 yards long, bearing nearly west and has a width of 200 yards outside the piers, 107 yards at the entrance between the pier ends, and narrowing to 72 yards at the river mouth. It is stable in character, but occasional dredging is necessary to maintain the required depth. The entrance channel had a depth of 19 feet with a minimum width of 200 feet at the inner end of the piers in July, 1920.

Connecting with the Government channel, the city authorities have improved the rivers by dredging from time to time.

Inner harbor.—The Milwaukee River, flowing down from the north, is joined about 1,100 yards above the inner ends of the piers by the Menomonee River, entering from the west, and about 1,000

yards south of the piers, where the natural mouth formerly discharged, the Kinnickinnic River empties from the south. These streams constitute the inner harbor of Milwaukee. The original condition of the rivers is not definitely known, but they have been dredged, and a depth of about 19 feet maintained therein, by the city. The channels are narrow, tortuous, and not provided with turning basins; several of the bridge openings are also too narrow, and their navigation is quite difficult.

The Milwaukee River is navigable for about 2½ miles, with average width of about 75 yards; the Menomonee River for about 2 miles, with average width of about 47 yards; and the Kinnickinnic River for about 2½ miles, with width of 50 yards to 67 yards. The maximum draft that can be carried is about 19 feet.

Dry docks.—The Milwaukee Dry Dock Co.'s south dock, located on the west side of Kinnickinnic River about 2,100 feet from the inner end of the north pier, and its west dock, located on the south side of Menomonee River at entrance to Kneeland Canal, have the following dimensions:

	South dock.	West dock.		South dock.	West dock.
	<i>Fect.</i>	<i>Fect.</i>		<i>Fect.</i>	<i>Fect.</i>
Length overall.....	445½	311	Width at top.....	85	70
Length on keel blocks.....	430	301	Width at gate.....	61	45½
Width at bottom.....	57	45½	Depth over sill at low-water datum.	13	12

Milwaukee, the largest city in Wisconsin, and the second port of importance on Lake Michigan, is a port of entry.

The city has an area of 26 square miles and is situated on the western shore of the spacious Milwaukee Bay. It is trisected by the Milwaukee, Menomonee, and Kinnickinnic Rivers, which unite in the heart of the city and empty through a common mouth into Lake Michigan.

The location and the excellent transportation facilities, both by land and water, make it one of the commercial centers of the north central section of the United States.

The residential section of the city is on a bluff 150 feet above Lake Michigan and 650 feet above sea level.

The population in 1920 was 457,147.

Communication.—Milwaukee is connected with the railroad systems of the United States by the Chicago, Milwaukee & St. Paul, Chicago & North Western, and Minneapolis, St. Paul & Sault Ste. Marie Railroads.

It is connected to cities on the eastern shore of Lake Michigan by lake ferries of the Grand Trunk and Pere Marquette Railroads.

Lake commerce.—The shipments greatly exceed the receipts. Coal is the principal commodity received. Other important items of commerce are flour, wheat, corn, oats, barley, and lumber.

Vessels with an aggregate net tonnage of 6,719,421 tons entered the port during the year of 1919. In the same year vessels with an aggregate net tonnage of 6,617,565 tons cleared the port.

Manufactures.—The principal factory products are iron, steel, metal, leather, shoes, meats, and flour.

A radio compass station will be constructed in the near future.

Coast Guard station is located in McKinley Park, north end of breakwater.

Storm warnings.—Day and night signals are displayed from a steel tower on Jones Island, south of entrance channel, about 100 feet from shore line.

Radio station.—A radio station is operated all the year by the United States Navy; call letters, NUK; working distance, 150 miles.

Bridges across Milwaukee, Menomonee, and Kinnickinnic Rivers at Milwaukee.

No.	Location and name.	Kind.	Draw openings—clear width.			Clear height above low-water datum.	Remarks.
			Right. ¹	Left. ¹	Center.		
MILWAUKEE RIVER.							
1	Chicago & North Western Ry. (Jefferson Street).	Railway....	Feet. 87.7	Feet. 87.5	Feet.	Feet. 5.1	See Note 1.
2	Broadway.....	Highway.....	.....	.....	100	13.7	See Note 2.
3	East Water Street.....	do.....	.....	.....	130	11.7	Do.
4	Buffalo Street.....	do.....	.....	.....	130	7.8	Do.
5	Huron Street.....	do.....	.....	.....	77.5	11.8	Do.
6	Michigan Street.....	do.....	.....	.....	80	8.5	Do.
7	Grand Avenue.....	do.....	.....	.....	70	10.7	Do.
8	Onelda Street.....	do.....	.....	.....	80	6.7	See Note 3.
9	State Street.....	do.....	58.5	60.5	.....	11.3	See Note 1.
10	Chestnut Street.....	do.....	68	63	.....	9.9	Do.
11	Cherry Street.....	do.....	55	55	.....	9.8	Do.
12	Point Street (across canal).	do.....	.....	.....	50.4	10	See Note 4.
13	Walnut Street.....	do.....	58.3	58.3	.....	8	See Note 1.
14	Holton Street (viaduct)....	do.....	.....	.....	65.8	64.9	See Note 2.
15	Racine Street.....	do.....	.....	.....	.....	22.9	Head of navigation; not lighted.
MENOMONEE RIVER AND CANALS.							
16	Chicago, Milwaukee & St. Paul Ry. (West Water Street).	Railway.....	.....	.....	75	4.4	See Note 5.
17	West Water Street.....	Highway.....	.....	.....	75	7.6	See Note 2.
18	Sixth Street.....	do.....	.....	.....	75	27.4	Do.
19	First Avenue.....	do.....	.....	.....	85	29.4	Across artificial channel called Menomonee Canal. See Note 2.
20	Muskego Avenue.....	do.....	.....	.....	70	8.9	See Note 2.
21	Chicago, Milwaukee & St. Paul Ry. (Florida Street)	Railway.....	70	.....	.....	4.4	Across artificial channel called Burnham's Canal. See Note 6.
22	Sixth Avenue.....	Highway.....	45	46	.....	6.8	Across Burnham's Canal. See Note 1.
23	Sixteenth Street.....	do.....	.....	.....	66	34.8	See Note 2.
KINNICKINNIC RIVER.							
24	Chicago & North Western Ry. (foot Lapham Street)	Railway.....	61.8	61.6	.....	7	See Note 1.

¹ Looking downstream toward the lake.

Bridges across Milwaukee, Menomonee, and Kinnickinnic Rivers at Milwaukee—Continued.

No.	Location and name.	Kind.	Draw openings—clear width.			Clear height above low-water datum.	Remarks.
			Right.	Left.	Center.		
KINNICKINNIC RIVER—CON.							
25	Kinnickinnic Avenue.....	Highway.....	Feet.	Feet.	Feet.	Feet.	See Note 2.
26	Chicago, Milwaukee & St. Paul Ry. (Zieler Street).	Railway.....	.....	93	100	9.2 14.4	See Note 7.
27	Chicago & North Western Ry. (between Kinnickinnic Avenue and Clinton Street).	do.....	.....	93	.....	14.4	See Note 8.
28	Clinton Street.....	Highway.....	62	62	.....	8.7	See Note 1.
29	Becher Street.....	do.....	54	54	.....	10	Do.
30	Lincoln Avenue.....	do.....	54	40	.....	9.1	Do.

Whistle signals for opening draws (condensed from detailed Regulations, below): All bridges, with the exceptions following, 3 short (— — —). No. 12, 2 short (— —). Nos. 16, 17, 25, 27, 4 short (— — — —). Red ball elevated by day or the appearance of the red lights on top of bridge at night indicates that draw can not be immediately opened. Bells at bridges acknowledge vessel signals, but do not indicate passage.

NOTE 1.—Low swing bridge. Red light on each end of draw piers; red light at each free end of protection piers; red light on each side of pivot piers; three lights on top of draw show red when bridge is closed and green when open.

NOTE 2.—Double leaf bascule. Red light on each end of roller piers; one light on each side of free end of each leaf shows red when bridge is closed and green when open.

NOTE 3.—Single leaf bascule. Red light on each end of roller pier and lift pier; one light on each side of free end of leaf shows red when bridge is closed and green when open.

NOTE 4.—One arm swing bridge opens to the north, turntable abutting easterly dock. One red light on each side of west abutment; one light on south side of fender work on east side of bridge; two lights on top of draw show red when bridge is closed and green when open.

NOTE 5.—One arm swing opens upstream, turntable abutting right dock. One red light at each end of right protection pier; one red light at upstream corner of left approach pier; three lights on top of draw show red when bridge is closed and green when open.

NOTE 6.—One red light on west draw pier; one red light on channel side of pivot pier; one red light on end of each protection pier on channel side; two lights on top of draw span show red when bridge is closed and green when open.

NOTE 7.—One red light on north draw pier; one red light on north side of pivot pier; one red light on west end of each protection pier; two lights on top of draw span show red when bridge is closed and green when open.

NOTE 8.—One red light on each side of south draw pier; one red light on channel side of pivot pier; one red light on each end of channel protection pier on channel side; three lights on top of draw span show red when bridge is closed and green when open.

Local regulations controlling navigation and operation of bridges are published by the local authorities. Mariners should obtain a copy of these regulations and carefully comply with them.

North Point is the northern limit of Milwaukee Bay.

The submerged crib of the new Linwood Avenue intake of the Milwaukee waterworks is located about 1.3 miles from the shore and 1.7 miles 50° (NE. $\frac{1}{4}$ E.) from North Point Light. There is about 53 feet depth over this crib. Vessels are cautioned not to anchor in the vicinity of the submerged crib. The old Milwaukee waterworks crib, a concrete structure with roof about about 10 feet above the water, is located 933 yards southeast by south from North Point Light. It is not lighted, as it is out of the line of navigation, and there is shallow water with rough bottom directly inside of it.

Light.—A fixed and flashing white light, 154 feet above water, visible, fixed 18 miles and flashing 21 miles, is shown from a buff

octagonal tower connected to a dwelling, on point about 1 mile north and east of North Point.

Whitefish Bay, is a slight recession about 6 miles across between North Point and Fox Point. The shore bank is about 1,100 yards wide, and submerged net stakes extend about 1,540 yards out at the middle of the bight.

In the northern part of the bay a narrow spit extends northwestward and has 16 feet of water 880 yards from shore.

Fox Point marks the northern limit of Whitefish Bay. Shoals extend 1,100 yards offshore, with but 8 feet near the outer edge of the bank east of the point.

At several places in the 15-mile stretch between Fox Point and Port Washington, reefs extend from the shore from 880 yards to 1 mile, with limiting depths of 11 to 14 feet at the outer limits.

The land bordering the shore south of Port Washington is a steep bluff having an average elevation of 100 feet.

Port Washington Harbor, about 25 miles north of Milwaukee, is an artificial Y-shaped harbor, consisting of a dredged and jettied entrance channel and two dredged basins. The bluffs forming the lake shore north and south of the harbor have an elevation of 100 feet or more and approach within a few hundred feet of the entrance. The Sauk River, a very small stream, does not enter the harbor, but discharges into the lake along the south side of the south pier.

Channel and basins.—The entrance channel is about 467 yards long bearing 295° (W. N. W.) and has a width of 125 yards outside the piers and about 40 yards between them. Connecting with the inner end of the entrance channel, the west basin extends due west 150 yards, with width of about 47 yards at the entrance and area of about 1½ acres; the north basin extends 18° (N. by E. ¾ E.) 250 yards, with a width of about 63 yards at the entrance and area of about 3½ acres. The basins are too small for anchorage of vessels, but the revetments afford mooring facilities. Severe gales cause so much disturbance in the basins that it is difficult to hold vessels at their moorings. The channel and basins are of stable character, but annual dredging is necessary for removal of shoals at the harbor entrance.

In June, 1920, the entrance channel had a controlling depth of 16 feet between the piers with a minimum width of 90 feet at the entrance to them. A shoal with a least depth of 15 feet, lies around the end of the south pier. There are some shoals at the upper end of the north basin.

Light.—A fixed red light, 42 feet above water, visible 9 miles, is shown from a red square pyramidal open framework tower, near the outer end of the north pier at Port Washington.

Fog signal.—The fog signal is made on a hand horn.

City.—The city, situated at the mouth of the Sauk River, has iron foundries and chair factories. The population is 3,340 (1920).

Coast.—From Port Washington the coast trends northeasterly for 27 miles to Sheboygan. It is bold and clear of shoals beyond the 880-yard limit but numerous net stakes exist 2 miles offshore in the deep offlying waters.

Sunken caisson.—A submerged caisson, with 17 feet over it, lies in 29 feet of water about 8 miles south-southwest of the Sheboygan pierheads and 767 yards offshore. It is entirely out of the usual path of vessels.

Sheboygan Harbor lies at the mouth of Sheboygan River, about 51 miles north by east from Milwaukee. It consists of a dredged channel protected by piers and improvements in the mouth of the river.

Sheboygan Reef is a detached shoal about 591 yards long north and south, with least depth of 5 feet over its center, which is 1,320 yards 28° (NNE. $\frac{1}{4}$ E.) from Sheboygan Pierhead Light.

Buoy.—A red nun buoy is moored near the eastern edge of the reef.

Breakwater and piers.—The old south pier, 917 yards long, extends due east about 833 yards beyond and normal to the shore on the south side of the river mouth. The north breakwater, with its outer end situated 207 yards 63° (NE. by E. $\frac{3}{4}$ E.) from the south pierhead, is 1,275 yards long, comprising a main structure of timber cribs and concrete caissons extending northwest 841 yards, and 453 yards of pile pier extending thence 284° (W. by N.) to the shore at a point about 700 yards northerly from the old north-pier stub. The stilling basin inclosed by the breakwater and south pier has an area of about 102 acres, which does not afford anchorage or mooring facilities for vessels.

Of the north pier there remains a stub pier 40 yards long, projecting about 100 feet beyond the shore line, with a north revetment at its inner end 140 yards long. The minimum clear width between the piers is about 78 yards.

Lights.—A flashing white light, 40 feet above water, visible 8 miles, is shown from a white skeleton tower, on the end of the South Pier.

A fixed red light, 31 feet above water, is shown from a red post on the stub end of the North Pier.

An occulting red light, 55 feet above water, visible 15 miles, is shown from a red cylindrical tower located on the southeastern end of the breakwater.

Fog signal.—The fog signal is made on an air siren.

Channel.—The entrance channel bears about due west and is about 1,100 yards long, with a width of about 120 yards from the outer end of the breakwater to near the stub end of the old north pier, where the width reduces to about 67 yards entering the river. Annual dredging is necessary for maintenance.

Connecting with the entrance channel the river is improved for 1.3 miles. From the inner end of the south pier the channel extends west for about 233 yards, then southwestward about 267 yards, then south by west about 233 yards, and then making a sharp turn to westward and northward in a distance of about 467 yards, it extends in a north by west direction. The Eighth Street Bridge crosses at about the middle of the sharp bend.

In August, 1920, the channel had a depth of 19 feet.

The channel holds the outside of the curve through Eighth Street Bridge and continues on the west side above until it hauls over to the east side passing through Pennsylvania Avenue Bridge and beyond.

City.—Sheboygan, situated on both sides of the Sheboygan River, has a Federal building, an insane asylum, hospitals, foundries, machine shops and manufactories of furniture, carriages, and leather goods. The population is 30,955 (1920).

A Coast Guard station is located near the inner end of the old north-pier stub.

Storm warnings.—Day and night signals are displayed from a steel tower at the Coast Guard station.

Bridges Across Sheboygan River at Sheboygan.

No.	Location and name.	Kind.	Draw open-ings—clear width.		Clear height above low-water datum.	Remarks.
			Right. ¹	Left. ¹		
1	Eighth Street.....	Highway....	<i>Fect.</i> 68.0	<i>Fect.</i> 68.0	<i>Fect.</i> 14.0	See Note 1.
2	Pennsylvania Avenue.....	do.....	.....	.....	17.6	See Note 2.
3	Chicago & North Western Ry. (Thirteenth street).	Railway....	60.0	60.0	18.3	Not lighted; very seldom opened.
4	Fourteenth Street.....	Highway....	52.5	52.5	13.0	Do.

¹ Looking downstream toward the lake.

Signal for opening draws, 3 blasts (— — —); bells on bridges are sounded before opening draws.

NOTE 1.—Three lights, showing red up and down stream when bridge is closed and green when open are placed over top of draw span, one in center and one at each end, the center light being about 12 feet higher than the end lights. There is a red light on each side of each abutment pier, one on each end of the guard pier, and one on each side of the center pier.

NOTE 2.—Single leaf bascule; 70-foot opening. Red light on each end of rolling pier and lift pier; 1 light, on each side of leaf at free end shows red when bridge is closed and green when open.

City bridge regulations.—Sec. 11. All drawbridges within the city of Sheboygan shall be and remain closed from 6.30 o'clock to 7.15 o'clock a. m.; from 12 o'clock m. to 1 o'clock p. m., and from 5.45 o'clock to 6.15 o'clock p. m. of each day, and any person who shall open such bridges during such time shall pay a penalty of not less than \$1 nor more than \$5.

Sec. 13. Pennsylvania Avenue bridge shall be and remain closed for six minutes immediately prior to the schedule time of leaving of all regular trains on the Chicago & North Western Railway.

Coast.—From Sheboygan the coast trends in a general northerly direction for about 24 miles to Manitowoc. In general this stretch of shore for about 1 mile offshore is more or less rocky and very uneven in depth, with bowlders and scattered shallow lumps. There are, however, no dangers lying far out, and heavy-draft vessels may navigate in the vicinity of the shore by giving it a proper berth.

Centerville (Hika), is 11 miles north of Sheboygan. Only the ruins of bridge piers remain and there is no water commerce at present.

Rock.—About 2 miles 172° (S. $\frac{1}{2}$ E.) from the inner end of the remains of the old Centerville pier and 1,167 yards from shore a rock about 25 feet in diameter with 3 feet on it rises abruptly from a depth of 20 feet. It might be a menace to launches and small craft able to navigate in the adjacent shallow water.

Shoals.—About $1\frac{1}{2}$ miles below Manitowoc piers, near Silver Creek, there is a large shoal with its outer limits 1 mile offshore, with depth of but 10 feet on its easterly point.

A shoal of rock formation and of irregular outline, about 333 yards across east and west and 167 yards north and south on the 21-foot curve, lies about 880 yards southeasterly from Manitowoc Shoal and $1\frac{1}{2}$ miles from shore; this shoal has a least depth of 15 feet on its extreme easterly edge, at a point 1.2 miles 136° (SE. $\frac{1}{2}$ E.) from the north breakwater light at Manitowoc.

A small shoal with least depth of 17 feet over it is located about 1 mile 118° (SE. by E. $\frac{1}{4}$ E.) from the pierhead light at Manitowoc.

Buoy.—A black spar buoy marks the northerly end of this shoal.

Manitowoc Harbor.—At the mouth of Manitowoc Harbor. In the immediate vicinity of the harbor the land on the north side is considerably higher than that on the south side.

Breakwaters and piers.—The harbor entrance between the breakwaters is 142 yards wide and is about 633 yards east of the mouth of the river. From the entrance, the north and south breakwaters, each 267 yards long, extend about northwest and southwest by west, respectively. At the shore line the inner ends of the new piers are 727 yards apart; the north pier extending from the foot of

Chicago Street about east by south a distance of 483 yards, and the south pier extending from the foot of Washington Street (prolonged) about east by north a distance of 400 yards. The interval between the outer end of each pier and the inner end of each breakwater is closed by 97 yards of concrete caissons, thus inclosing the stilling basin by continuous structure on either side. Only stubs of the old north and south piers remain.

Outer basin and channel.—The outer basin inclosed by the breakwaters and piers has an area of about 78 acres; it is not adapted for anchorage of vessels, but greatly reduces wave action in the lower river.

The entrance channel, 167 yards wide through the outer basin and 667 yards long, extends due west to the mouth of the river, and is easily and safely navigated. Occasional dredging is necessary to maintain the required depth. In July, 1920, the channel through the outer basin had a depth of 18 feet with a width of 127 yards at the entrance and 67 yards at the mouth of the river.

Connecting with the Government channel, the city maintains a 19-foot channel with least width of about 60 yards to the first crossing of the Minneapolis, St. Paul & Sault Ste. Marie Railroad; thence an 18-foot channel with similar width to the foot of Park Street; thence a 17-foot channel with width of about 50 yards to the second crossing of the above-mentioned railroad; thence a 10-foot channel with width of about 80 feet to the Chicago & North Western Railroad Bridge, and a similar channel continuing about 167 yards upstream from that bridge. The shoals generally forming in the channel during the winter and spring freshets have, in recent years, been subsequently located and removed by dredging so as to maintain the channel conditions above stated.

Dry dock.—The dry dock of the Manitowoc Shipbuilding Co., just below the first crossing of the Minneapolis, St. Paul & Sault Ste. Marie Railroad on the inner channel, has dimensions as follows: Length, 350 feet over all, 340 feet on blocks; width, 60 feet at top, 44 feet at gate; depth on sill, 12½ feet.

In addition to the above, there is a floating dock 360 feet long, with 14 feet of water over the keel blocks, capable of taking vessels up to 420 feet long and 70 feet wide.

Light.—A flashing white light, 41 feet above water, visible 8 miles, is shown from a white pyramidal shaft on a pedestal on the outer end of the south breakwater.

Range lights—Front light.—A fixed red light, 52 feet above the water, visible 15 miles, is shown from a red cylindrical tower on a building located on the south end of the north breakwater.

Fog signal.—The fog signal is made on an air diaphone.

Bear light.—A fixed red light, 42 feet above water, visible 9 miles, is shown from a red, square, pyramidal tower located near the end of the north pier, 267° (W. $\frac{1}{2}$ S.) from the front light.

These lights form a range for approaching the harbor.

City.—The city of Manitowoc is situated on both sides of the river at its mouth. The industries comprise machinery, iron, flour, leather, lumber, and edge tools, also shipbuilding. A large lake trade is carried on. The population is 17,563 (1920).

Storm warnings.—Day and night signals are displayed from a steel tower at the foot of North Seventh Street, about 15 feet from the river dock.

A radio station is operated all the year by the United States Navy; call letters NTY; working distance, 150 miles.

Bridges across Manitowoc River at Manitowoc.

No.	Location and name.	Kind.	Draw openings—clear width.		Clear height above low-water datum.	Remarks.
			Right. ¹	Left. ¹		
1	Eighth Street.....	Highway....	<i>Fed.</i> 60.8	<i>Fed.</i> 60.8	<i>Fed.</i> 12	See Note 1.
2	Tenth Street.....	.....do.....	64	64	13	Do.
3	Minneapolis, St. Paul & Fault Fte. Marie Ry. (first cross- ing).	Railway.....	.....	.....	4.86	Single leaf bascule, clear opening 69 feet. See Note 2.
4	Minneapolis, St. Paul & Fault Fte. Marie Ry. (second crossing).	.....do.....	61	61	4.9	Not lighted; seldom opened.
5	Chicago & North Western Ry.	.....do.....	60.8	60.8	10	Do.
6	Minneapolis, St. Paul & Fault Fte. Marie Ry. (third cross- ing).	.....do.....	45	45	10.53	Fixed bridge; not lighted; channel not dredged.
7	Manitowoc, Green Bay & North Western Ry. (about 1,500 feet upstream from preceding bridge).	.....do.....	.....	.....	52	Fixed bridge; width between piers 65 feet; not lighted; above head of navigation.

¹ Looking downstream toward the lake.

NOTE 1.—Low swing bridge. Red light on each end of draw pier; red light at each free end of protection piers; red light on each side of pivot pier; 3 lights on top of draw span show red when bridge is closed and green when open.

Signals for opening draw: 3 blasts (— — —) for Eighth Street; 2 short, 1 long (— — —) for Tenth Street.

NOTE 2.—Red light on each end of rolling pier and lift pier; 1 light on each side of the leaf at free end shows red when bridge is closed and green when open.

Signal for opening draw: 2 short, 1 long (— — —).

Regulations to govern the opening of drawbridges across Manitowoc River at Eighth and Tenth Streets, Manitowoc, Wis., prescribed by the Secretary of War.

THE REGULATIONS.

1. The draws of the above-named bridges shall be immediately opened for the passage of foreign vessels and "vessels of the United

States" as defined by section 4311 of the Revised Statutes, at all times during the day or night except between the hours of 12.05 p. m. and 12.15 p. m., upon a signal of three short blasts to be given by blasts of a horn or steam whistle for the Eighth Street Bridge, and upon a signal of two short and one long blasts, similarly given, for the Tenth Street Bridge.

2. In case street traffic shall have been delayed by reason of the draws of either of the above-described bridges having been continuously open for 10 minutes or more for the passage of any of the vessels before described, the draws of said bridge may be closed, but shall be again opened for the passage of said vessel as soon as practicable: *Provided*, That in such case the opening of either of the above-described bridges for the passage of any vessel before described shall not be delayed more than five minutes after the proper signal is given.

3. When signal is given by a car ferry or other large vessel to pass either of the two bridges, the remaining bridge shall also be promptly opened, so that such vessel shall not be held between the two bridges, thus creating a source of danger.

4. In case either draw can not be immediately opened when the signals are given, a red flag or ball by day or a red light at night shall be conspicuously displayed thereat.

City regulations affecting navigation are published by the local authorities. Mariners should obtain a copy of these regulations and carefully comply with them.

Two Rivers Harbor lies about 5 miles northeast of Manitowoc. The coast between is clear within 440 yards except for a few outlying net stakes and a shallow area lying from $1\frac{1}{4}$ to $1\frac{1}{2}$ miles northeasterly from the pierhead light at Manitowoc and from 880 to 1,320 yards from the shore. Near the outer edge of this shoal is a rock lying a little over 1 mile 42° (NE. $\frac{1}{2}$ N.) from the pierhead light at Manitowoc.

The harbor is formed by East and West Twin Rivers uniting immediately inside the original shore line of Lake Michigan, and discharging through a common outlet into the lake. The lake shore for a distance of several miles each side of the harbor is composed of sand elevated but slightly above the lake.

Piers and revetment—Stilling basin.—The south pier is 573 yards long, extending in a southeast by south direction about normal to and projecting about 317 yards beyond the shore line. The north pier is 547 yards long, with its outer end about 450 yards beyond the shore and abreast of the end of the south pier; the outer 252 yards is approximately parallel to and about 82 yards from the south pier, and thence the diverging part inclosing the stilling basin extends

north by east for 245 yards and then about northwest by north for 50 yards to the shore, about 250 yards from the south pier.

The stilling basin is triangular in shape, with frontage of 170 yards along the channel and 167 yards on the shore line and a depth of from 13 to 4 feet; it is not used by vessels, its purpose being to permit the expansion of waves and reduce disturbance in the inner harbor basin.

The revetment on the north side of the inner end of the channel is about 150 yards long, and is in line with the outer portion of the north pier and separated therefrom by the opening of 170 yards into the stilling basin.

Channel and inner harbor basin.—The entrance channel, 700 yards long, extends 327° (NW. $\frac{1}{2}$ N.) from deep water in the lake to the basin at the confluence of Twin Rivers, varying in width from 167 yards at the outer end to 67 yards between the piers. From the inner end of the entrance channel the East Twin River branch of the inner basin extends about 133 yards about north by east, and the West Twin River branch extends about 83 yards about southwest by west. This harbor basin is 53 yards wide at the northerly end, 100 yards wide at the entrance channel, and 77 yards wide at the south end.

In July, 1920, the channel had a depth of 14 feet, with a minimum width of 160 feet.

Connecting with either end of the harbor basin, East Twin River has a depth of 11 feet to Seventeenth Street Bridge and West Twin River a depth of 15 feet to Washington Street Bridge. Above these bridges the East and West Twin Rivers have a navigable depth of 7 feet for distances of 3 and 7 miles, respectively, from the entrance channel. Only small pleasure craft operate on these rivers, the West Twin River being still used for floating saw logs.

Light.—A fixed red light, 35 feet above water, visible 9 miles, is shown from a red square pyramidal tower on the pierhead at Two Rivers.

Town.—The town, situated at the junction of the two rivers, has furniture factories and a canning industry. The population is 17,563 (1920).

A Coast Guard station is located near the inner end of the north pier.

Storm warnings.—Day and night signals are displayed from a steel tower in front of the Coast Guard station.

Bridges across East and West Twin Rivers at Two Rivers Harbor.

No.	Location and name.	Kind.	Draw open- ings—clear width.		Clear height above low- water datum.	Remarks.
			Right. ¹	Left. ¹		
EAST TWIN RIVER.						
1	Seventeenth Street.....	Highway....	<i>Feet.</i> 68	<i>Feet.</i> 62.6	<i>Feet.</i> 14.5	See Note 1.
WEST TWIN RIVER.						
2	Washington Street.....	Highway....	20	66	11.5	See Note 2.
3	Monroe Street.....	do.....	45	43	9.7	See Note 3.
4	Chicago & North Western Ry.	Railway....	49.1	49.3	10.5	Not lighted; seldom opened.

¹ Looking downstream toward the lake.

NOTE 1.—One red light on each corner of each approach pier; one red light on each end of center pier and on each side at center of same; three lights on top of draw span showing red when bridge is closed and green when open.

NOTE 2.—Left channel navigable. One red light on each corner of left approach pier; one red light on each end of center pier and on left side at center of same; three lights on top of draw span showing red when bridge is closed and green when open.

NOTE 3.—One red light on each corner of left approach pier; one red light on each end of center pier show lights on top of draw span showing red when bridge is closed and green when open.

CITY BRIDGE REGULATIONS AND SIGNALS.

SECTION 1. The signal for opening the bridges on West Twin River in said city for the passage of vessels and all steam or other craft sailing or plying in the harbor and rivers of said city shall be three long blasts (—— ———).

SEC. 2. The signal for opening the bridge on East Twin River in said city for the passage of vessels and all steam or other craft sailing or plying in the harbor and rivers of said city shall be two long blasts (—— ———).

SEC. 3. The bridge tender or other person whose duty it is or may be to tend and open the said bridges for the passage of such vessels and craft shall promptly respond to such bridge signals and open the bridge indicated by the signal.

SEC. 4. All officers or persons in charge of such vessels, steam or other craft, desiring to pass through or by either bridge shall give the signals established and required to be given by this ordinance at least 600 feet distant from said bridges.

SEC. 5. No bridge shall be opened between the hours of 6 and 7 a. m., and between 12 and 1 p. m., and from 5.30 to 6.30 p. m.

Rawley Point (broad and rounding), lies northeastward of Two Rivers. The coast between curving outward is fronted by shoal water for 1,320 yards offshore and has some offlying net stakes. Around Rawley Point the waters are obstructed for $1\frac{1}{2}$ miles offshore by net stakes.

Twin River Point Light, fixed and flashing white, 113 feet above water, visible 19 miles, is shown from a white, octagonal, skeleton tower, on Rawley Point.

Fog signal.—The fog signal is made on an air diaphone.

Coast.—Kewaunee is about 17 miles northward of Rawley Point. The coast between recedes somewhat to the westward and is lined with rocky shallows from 880 yards to 1 mile out from it.

Nero (Two Creeks).—The town of Nero, located in this stretch about 6 miles from Two Rivers, has a dock extending to a depth of about 12 feet in the lake, for the accommodation of occasional small freight vessels which call.

About 10 miles south of Kewaunee are several small rocky shoals on the following distances and bearings from the end of the dock at Two Creeks: A spot with 20 feet, 1.87 miles, $31^{\circ} 30'$ (NNE. $\frac{1}{2}$ E.); a small group with 18 feet depth, 2.47 miles, 32° (NNE. $\frac{5}{8}$ E.); a spot with 18 feet, 1.03 miles, $57^{\circ} 30'$ (NE. $\frac{1}{2}$ E.).

Kewaunee Harbor is formed by a dredged channel to the mouth of the river protected by piers and the improvements in the river. The immediate vicinity of the mouth of Kewaunee River is flanked by broad areas of swamp lands.

Piers.—The piers are approximately parallel and about 67 yards apart, each being 617 yards in length and bearing west-northwest. The north pier projects 617 yards and the south pier 500 yards beyond the shore line.

Light.—A fixed white light, 43 feet above water, visible 14 miles, is shown from a white square pyramidal tower connected to a fog signal building on the outer end of the south pier.

Fog signal.—The fog signal is made on an air diaphone.

Channel and basin.—The entrance channel has a width of 53 yards and is 733 yards long from deep water in the lake to the turning basin just inside of the shore line. The basin is about 267 yards long in continuation of the entrance channel, with width of 243 yards at the east and 150 yards at the westerly end. The basin has no revetment along its northerly side and it is not adapted for the anchorage of vessels. The original outlet of the Kewaunee River, which forms the north branch of the inner harbor, has a minimum width of about 58 yards between the shore lines, and extends about 267 yards 71° (ENE. $\frac{1}{2}$ E.) from the northeasterly corner of the turning basin to the Government property, where 83 yards of dock frontage is available for mooring Government plant.

In April, 1920, there was a depth of 18 feet in the entrance channel and to the Goodrich Dock on the south side of the basin.

Connecting with the northwesterly corner of the turning basin, the Kewaunee River is navigable for a distance of about $6\frac{1}{2}$ miles above its mouth for craft drawing not more than 4 feet. There is no regular commerce on this part of the river.

Shoals in harbor approach.—A hard gravel and boulder reef, with a depth of less than 21 feet covering an irregular area about 433

yards long north and south and 333 yards wide, lies about $1\frac{1}{4}$ miles from the harbor entrance. The least depth on the reef, about 13 $\frac{1}{2}$ feet, lies 1.2 miles 116° (SE. by E. $\frac{1}{2}$ E.) from the south pier light.

Buoy.—The 13 $\frac{1}{2}$ -foot spot is marked by a black can buoy moored in 18 feet north of it.

The alignment of the range lights leads northward of the reef.

Two smaller shoals, each with about 16 feet least depth, lie 1,320 yards 122° (SE. by E. $\frac{1}{2}$ E.) and 1,637 yards 140° (SE. $\frac{1}{2}$ S.), respectively, from the front range light.

There are boulders with 12 or 13 feet on them just north of the entrance between the piers.

Range lights—Front light.—A flashing red light, 40 feet above the water, visible 6 miles, is shown from a red pyramidal skeleton tower located near the outer end of the north pier.

Rear light.—A fixed red light, 62 feet above the water, visible 8 miles, is shown from a red pyramidal skeleton tower located on the shore end of the south pier 505 yards 284° (WNW. $\frac{1}{2}$ W.) from the front light.

These lights in range lead up to the entrance between the piers and clear of the shoals in the approach.

Town.—The town of Kewaunee is situated on the south side of the entrance to the river. It has various manufactories, foundries, and machine shops, also an extensive lake shipping trade in produce, canned goods, flour, and grain.

A Coast Guard station is located on the north side of the harbor entrance.

Storm warnings.—Day and night signals are displayed from a steel tower on the south bluff near the lake, about two blocks from the center of the city.

Bridge across Kewaunee River at Kewaunee.

No.	Location and name.	Kind.	Draw openings— clear width.		Clear height above low- water datum.	Remarks.
			Right. ¹	Left. ¹		
1	Park Street ²	Highway....	<i>Feet.</i> 68	<i>Feet.</i> 68	<i>Feet.</i> 9	Seldom opened; not lighted for navigation purposes, being practically above the head of navigation.
2	Kewaunee, Green Bay & Western R. R.	Railway....	30	30	4.6	About 2 miles from mouth of river; seldom opened.

¹ Looking downstream toward the lake.

² The bridge formerly at Miller Street has been superseded by Park Street Bridge, situated one block north. At Miller Street the superstructure is all removed.

There are no published city harbor regulations.

Coast.—From Kewaunee the coast trends northeastward for about 11 miles to Algoma. The shore is rather hilly and shoal water extends about 1,320 yards off from it.

Algoma (Ahnapee) Harbor.—This harbor is at the mouth of the Ahnapee River and consists of a dredged channel protected by piers and improvements in the river. In the immediate vicinity of the river mouth the elevation of the ground is only a few feet above lake level, but about 167 yards north and 833 yards south it rises to a height of 40 feet or more.

Outer harbor—Piers and breakwater.—The present small harbor outside of the shore line is inclosed by the old north pier, extending into the lake approximately normal to the shore line, and by a new south pier and breakwater, constructed on a diverging line to form an outer basin.

The north pier is of irregular alignment, with general southeast by south direction, and consists of a main structure 267 yards long and a detached portion 100 yards long starting abreast and 30 feet north of the outer end of the main structure; a line of guide piling extends diagonally across the opening between the two sections. The pier projects 350 yards beyond the shore line.

The new south pier, 316 yards long, of timber construction, starts from the shore at a point about 333 yards south of the original river mouth, and extends about southeast by east for 129 yards and then east by south for 187 yards. From this point the concrete breakwater, about 167 yards long, extends 161° (SE. by E. $\frac{1}{2}$ E.), and then the outer 100 feet of the old south pier, which was left in place at the harbor entrance, bears 129° (SE. $\frac{1}{2}$ E.). About 158 yards of the inner length of the old south pier also remains in position at the river entrance.

Shoal.—A detached 13-foot spot lies 1 mile east of the Algoma Pierhead Light.

Channel and basin.—The entrance channel extending generally about north by west from deep water in the lake to a point in the river about 167 yards above Second Street bridge, is about 867 yards long, with width varying from 53 yards at the harbor entrance to 58 yards at the river mouth and then narrowing to about 50 feet at the upper end. The upper 400 yards is a narrow rock cut and vessels should proceed with caution in this section.

The basin formed by the new south pier contains about $11\frac{1}{2}$ acres, about half of which, adjoining the entrance channel, has a depth of about 14 feet. Vessels land at the Merchants Dock in the basin, but there is not sufficient room for anchorage.

In July, 1920, the entrance channel had a depth of 14 feet, with a width of about 100 feet from the entrance pier to the outer end of the old south pier; then to the bridge the depths vary from $13\frac{1}{2}$ to 6 feet.

Along the western side of the basin, there is a channel with a navigable depth of about 14 feet and a minimum width of 80 feet that extends up to the Merchants Dock company's dock.

The river has a navigable depth of 4 feet for a distance of about 2 miles from the western terminus of the Government improvement, but there are no vessels plying upon it. The bed of the river is solid rock.

Range lights—Front light.—A fixed red light, 22 feet above water, visible 4 miles, is shown from a red post on the end of the north pier.

Rear light.—A fixed red light, 37 feet above water, visible 9 miles, is shown from a red square pyramidal tower on the north pier 33 yards, 316° (NW. $\frac{1}{4}$ W.) from the front light.

These lights in range show the direction of the harbor entrance.

Fog signal.—The fog signal is made on an air diaphone.

Bridges across Ahnapee River at Algoma.

No.	Location and name.	Kind.	Draw openings— clear width.		Clear height above low- water datum.	Remarks.
			Right. ¹	Left. ¹		
1	Second Street, about 2,000 feet from harbor entrance.	Highway....	<i>Feet.</i> 73	<i>Feet.</i> 73	<i>Feet.</i> 9	Seldom opened; left draw not accessible. See Note.
2	Fourth Street.....	.....do. ....	.....	.....	8	Fixed bridge; clear width be- tween piers, 18 feet; not lighted for navigation pur- poses.

¹ Looking downstream.

NOTE.—There are no lights on this bridge.
Signal for opening draw, 3 blasts (— — —); bell on bridge sounds return signals.

Local regulations affecting navigation are published by the local authorities. Mariners should obtain a copy of these regulations and comply with them.

Coast.—From Algoma the coast trends northeasterly for 14 miles to Sturgeon Bay and Lake Michigan Ship Canal. For 10 miles to the northward of Algoma the coast is hilly and bordered by rocky shoals extending from 660 to 1,320 yards offshore. The remainder of the stretch, 4 miles, has a low shore, the southern half of which is bordered by shoals and outlying spots extending from 1,100 yards to 1½ miles offshore, with a least depth of 11 feet on the outer edge. The remainder of the shore to the canal is shoal within the 440-yard limit.

Buoy.—A red nun buoy marks the eastern edge of the shoal area extending 1½ miles from shore.

Caution.—The shore to the southward of the buoy should not be approached nearer than 1 mile.

Sturgeon Bay and Lake Michigan Ship Canal.—This waterway connects the waters of Lake Michigan with those of Green Bay through an arm of the latter known as Sturgeon Bay.

The canal is about 1.4 miles long northwesterly and southeasterly, and for 1.2 miles from the eastern end it has a width of 160 feet, the remaining part is 250 feet wide. The controlling depth is about 19 feet.

Harbor of refuge.—The outer harbor or stilling basin is inclosed by two converging piers extending into Lake Michigan from the shore on either side of the easterly end of the canal. This work is a harbor of refuge in name only, the area inclosed being too small to be of any value as such; but it furnishes adequate protection to the lake end of the canal and affords an easy entrance thereto.

The north pier, bearing about southeast by south, consists of a main pier 378 yards long, and a detached pier 50 yards long; total length 448 yards; they are connected by 165 feet of guide or fender piling. The south pier, bearing about 118° (SE. by E. $\frac{1}{2}$ E.), is of the same length and construction. The piers project beyond the shore line about 440 yards and 347 yards, respectively; the clear distance between them at the entrance is 112 yards, at the narrowest part 78 yards, and at the shore line 263 yards.

The basin formed by the converging piers is 353 yards long, measuring from its narrowest portion to the canal entrance, and from 263 to 78 yards wide; it has an area of 12 acres, and an average depth of about 8 feet outside the 19-foot channel described below. It is not adapted for anchorage or moorage of vessels.

Channel.—The entrance channel from deep water in Lake Michigan through the outer harbor to the eastern end of the canal bears about northwest and is 433 yards long, varying in width from 200 yards at the outer end to 53 yards at the canal entrance. Thence the revetted canal extends 1.4 miles on the same line to Sturgeon Bay, between revetments 53 yards apart for the easterly 1.2 miles and 83 yards apart for the westerly 333 yards. The channel through Sturgeon Bay 67 yards wide, extends 2.7 miles northwestward from the westerly end of the canal, then 2.3 miles to Hills Point, a total length of 5 miles. In the latter channel and near the westerly end of the canal, a turning basin was formed by enlarging the channel; beginning 167 yards west of the ends of the revetments, the width increases to 167 yards in a distance of 167 yards, continues with this width for a length of 200 yards, and then decreases in a further distance of 167 yards to the normal channel width of 67 yards.

The dredged channel from the canal northwesterly to Sturgeon Bay bridge is marked by black spar buoys on the northeasterly edge and red spars on the southwesterly edge.

After passing through the canal from the eastward, it should be borne in mind that Sturgeon Bay, into which the canal leads, is open to the northwestward and is accordingly buoyed from that entrance.

The controlling depth in the entrance channel from Lake Michigan and in the canal is 19 feet for a width of 160 feet.

Shoals in approach to harbor of refuge.—A shoal area lies a little southerly of a point about 167 yards to eastward of the outer end of the south pier, and is of solid rock formation. The minimum depth on this shoal is $16\frac{1}{2}$ feet below datum, so that, at a low summer or fall stage of water and in a seaway, a vessel drawing about 16 feet would be liable to strike. While the shoal lies to the southward of the entrance, and would not be encountered on the proper channel course, vessels occasionally enter in a direction which would carry them very close to this shoal; the attention of all masters is therefore directed to the presence of this menace.

A shoal with 19 feet least water is located in Lake Michigan, a little over 1 mile beyond the pierhead light and about 267 yards northeast of the prolongation of the axis of the canal.

Sturgeon Bay Canal Light, alternating flashing red and white, 107 feet above water, visible 19 miles, is shown from a white cylindrical tower, on the north side of the entrance to the canal from the Harbor of Refuge.

Light.—A fixed red light, 40 feet above water, visible 10 miles, is shown from a red cylindrical tower attached to a fog-signal building on the end of the north pier.

Fog signal.—The fog signal is made on a steam whistle.

Southeast Entrance Light No. 1, fixed red, 11 feet above water, is shown from a red square inclosed wooden structure, on the northeast side of the entrance to the canal from the Harbor of Refuge.

Northwest Entrance Light No. 3, flashing red, 19 feet above water, is shown from a red, square, pyramidal, skeleton tower about $1\frac{1}{2}$ miles northwest of Light No. 1.

Northwest Entrance Cut Light No. 4, flashing white, 21 feet above water, is shown from a white, square, pyramidal skeleton tower on a crib, 1,833 yards northwest of Light No. 3.

Coast Guard station is located on the north side of the eastern entrance to the canal.

Storm warnings.—Day and night signals are displayed from a steel tower on the south side of the foot of Spruce Street, near the corner of Main Street.

Bridge.—A highway and railway bridge connects St. John Street, Sturgeon Bay, with the village of Sawyer. It has a clear height of 14 feet above low-water datum and a clear width of 77 feet in each draw opening. Signal for opening draw, 3 blasts (— — —); a bell on the bridge is sounded before opening.

A fixed white light, visible 16 miles, is shown from a steel tower 10 feet high, erected on the top chord at the center of the draw span. A white light is displayed at draw end of each bridge abutment, red lights on ends of center pier and draw protection, and red lights on face of each abutment and on center pier protection; three lights, visible up and down the channel, show red when bridge is closed and green when open.

Dry dock.—The floating dock of the Universal Shipbuilding Co., located on the northeast side of Sturgeon Bay about 3,000 feet northwesterly from the bridge, has a length over all of 200 feet, a width of 45 feet, and a depth of 13 feet over the keel blocks.

Regulations prescribed by the Secretary of War for the navigation and use of Sturgeon Bay and Lake Michigan Ship Canal:

1. **Authority of canal officers.**—The movement of all boats and floating things in the canal, and in the approaches thereto, shall be under the direction of the superintendent or his authorized assistants, and their orders and instructions must be obeyed.

2. **Signals.**—On entering the canal at either entrance, steamers or tugs must blow their whistles for one minute in order to warn craft approaching from opposite direction and give them time to guard against collisions, by tying up if necessary. All steamers approaching others going in the opposite direction shall slacken speed so as to pass in safety. Compliance is required with Rule V of the rules and regulations for the government of pilots, adopted by the Board of Supervising Inspectors.

“Rule V. Whenever a steamer is nearing a short bend or curve in the channel where, from the height of the banks or other cause, a steamer approaching from the opposite direction can not be seen for a distance of half a mile, the pilot of such steamer, when he shall have arrived within half a mile of such curve or bend, shall give a signal by one long blast of the steam whistle, which signal shall be answered by a similar blast given by the pilot of any approaching steamer that may be within hearing. Should such signal be so answered by a steamer upon the farther side of such bend, then the usual signal for the meeting and passing shall immediately be given and answered; but if the first alarm signal of such pilot be not answered, he is to consider the channel clear and govern himself accordingly.”

3. **Speed.**—The rate of speed while passing through the canal shall not exceed 5 miles per hour.

4. **Keeping in the center.**—The center must be kept all the way through, except in passing other craft. In case of grounding, the rapid or strong working of boat's engines is strictly forbidden.

5. **Draft of boats.**—No vessel shall enter the canal whose actual draft exceeds the least depth of water in the channel of the canal as given by the superintendent.

6. **Turning around in canal.**—Tugs or other steam vessels exceeding 150 feet in length are forbidden to turn around, or to attempt to turn around, in the canal.

7. **Navigating the canal.**—All vessels and boats are forbidden: (a) To enter the canal two or more abreast; (b) to pass another while going in the same direction in the canal; (c) to pass another canal in more than one line going each way; (d) to obstruct the canal in any way or to delay, by slow passage through the canal or by any other means, the progress of other vessels; (e) to attempt passing the canal in the face of running ice, except at their own risk and liability to make good any damage to the canal or its banks, which may result from such attempt.

8. **Rafts.**—The passage of "bag" or "sack" rafts or of loose logs into or through the canal is prohibited.

Rafts shall be made up with logs parallel to each other, in the direction of raft lengths, secured and held closely together by frequent crossties, chains, or cables.

Rafts shall not be of greater dimensions, either way, than 50 feet wide by 600 feet long, and if longer than 300 feet shall be handled by two tugs.

No raft shall pass through the canal, unless by special permission of the superintendent or his authorized assistants, who will direct a time for passing that will least interfere with other navigation.

Masters of tugs and other persons in charge of rafts are required to avoid damaging the canal revetments and displacing buoys, spars, or the pedestal of any range light aiding navigation through the canal. They shall keep careful watch when passing aids to navigation, and should any be accidentally displaced, shall report the fact at the earliest possible moment to the superintendent or his authorized assistants.

9. **To shorten sail.**—No vessel, however, propelled or being towed, shall pass through the canal with sail or sails up, except sail vessels running with a fair wind. Every craft that sails into or attempts to sail into or through the canal must be responsible for any damage resulting therefrom.

10. **Towing.**—All boats engaged in towing vessels that are laden, or partially laden, shall use two towlines and shorten them to the greatest extent, so as to have full control of their tows, and thereby

avoid accident while meeting or otherwise passing other craft. Boats that are towing vessels without cargo need use but one towline, but the line between the steamer and the first vessel or barge of the tow must not exceed 100 feet in length. Towing more than one craft abreast, or rafts of greater width than 50 feet, is forbidden.

Towing in the same tow of more than one scow or barge of 1,000 tons or more, of a draft not exceeding 10 feet when loaded, whose load is carried on the deck, is hereby prohibited, except upon condition that there shall be two towlines between each vessel in the tow, the lines to be secured to the starboard and port quarters of each craft, and to be of a length not to exceed 25 feet in the clear.

11. Harbor of refuge.—The anchoring or mooring of any craft in any part of the canal, except at such place or places as may be directed by the superintendent, is strictly forbidden. The master of any craft entering into the canal for shelter shall report such fact at once to the superintendent, who will thereupon assign a mooring to such craft. Moorings will usually be assigned at the westerly end of the canal. Under no circumstances shall vessels, other than those on Government business, be permitted to moor or make fast to either of the converging piers or any of the appurtenances thereto at the Lake Michigan entrance to the canal. Should it become necessary, in the judgment of the superintendent, for a vessel moored in the canal to change its moorings the vessel shall be promptly moved as may be directed by the superintendent.

12. Injury to cribs, piers, and sheet piling.—Vessels shall use great care not to strike or injure the cribs, piers, sheet piling, or any structure pertaining to the canal.

13. Refuse in canal.—No person shall roll or throw any stones, ashes, cinders, or other material into the canal or the approaches thereto, or place any such material on any bank or berm of the canal so that it is liable to be thrown or roll in.

14. Obstructing navigation.—Any one who shall willfully or through carelessness in any way obstruct the free navigation of the canal, or by the violation of any of the laws or regulations governing the canal and those using it, delay or inconvenience any boat having the right to use the canal, shall be responsible for all damages and delays and for all expenses of removing the obstructions.

15. Commercial statistics.—The masters or clerks of all vessels using the canal (except in the case of vessels merely entering to seek a harbor of refuge from storms and not bound through) shall furnish in writing to the superintendent a detailed statement of passengers and cargo carried.

16. Vessels or craft sinking in canal.—In case of any boat, vessel, or other craft or raft sinking or grounding in the canal, or otherwise obstructing it, the officer or agent of the United States in

charge of the canal shall have the right to take such possession of such vessel, boat, or other craft or raft, as shall be necessary for the purpose, and remove it, and clear the canal of the obstruction caused by it, and no one shall interfere with or prohibit him from doing so, or do anything that will tend to interfere with or prohibit him from doing so: *Provided*, That the officer or agent of the United States may, in his discretion, give notice in writing to the owners of any vessel, boat, or other craft or raft obstructing the canal as aforesaid.

Coast.—From Sturgeon Bay Channel entrance to Whitefish Point, a distance of $7\frac{1}{2}$ miles, the coast trends in a northeastward direction and should not be approached within a mile, as rocky reefs extend out in places to nearly that distance.

Shoal.—A detached shoal with 12 feet of water lies about 880 yards east-southeastward of Whitefish Point and extends southerly about 880 yards.

Buoy.—A red spar buoy known as Whitefish Point Shoal Buoy marks the outer edge of the shoal.

Whitefish Bay.—Between Whitefish Point and Cave Point, a distance of about 4 miles, the coast curves in to the westward, forming Whitefish Bay. Shoal ground makes out along the shore of the bay for about 880 yards, but this has depths of 16 feet. There are also some net stakes projecting out from the shore.

Shoal.—A detached shoal with 16 feet on it lies $2\frac{1}{2}$ miles, 41° (NE. $\frac{3}{4}$ N.) of Whitefish Point.

Jacksonport, about 3 miles north of Cave Point, is a fishing settlement and a shipping point for cordwood and cedar. There are two landing piers in fair condition, with 8 to 10 feet of water at their outer ends. The shoal to the north and Cave Point to the south afford considerable shelter to vessels in all but southeast winds and except in heavy weather.

Shoal.—A shoal with very scant depths extends $1\frac{3}{4}$ miles southeasterly from the shore at Jacksonport; just below this the offshore bank is 1,320 yards in extent, diminishing toward Cave Point.

Coast.—From Jacksonport the coast trends slightly northeastward for about 10 miles to Bailey Harbor. The shore bank along this stretch is quite irregular. There are also submerged net stakes along this shore.

Bailey Harbor, southwest of Mud Bay, is sheltered and affords good anchorage, but is subject to considerable surge during heavy seas. Shoals make out 1 mile southerly from the point on the east side of this harbor. An abandoned lighthouse tower stands on an island abreast of the southerly end of the east entrance point. Shoal water borders the east shore for 440 yards and the north and west shores for 880 yards.

From the point south of the harbor a shallow spit runs out to the southeast about 1,100 yards and about $1\frac{3}{4}$ miles east-southeast from the point is a shoal area extending about 400 yards north and south and 200 yards east and west on the 21-foot curve, on which there are a number of spots having 16 feet or less depth.

Buoy.—A red spar buoy marks the southwest corner of the shoal area, extending southerly from the point on the eastern side of the harbor.

Middle Ground Shoal lies in the southwesterly entrance of the harbor, and is 1,540 yards long north and south with depths of 1 to 12 feet.

Buoy.—A black spar buoy marks the southeastern point of Middle Ground Shoal.

Obstruction.—In the middle of the harbor, about 1,600 yards west of the east entrance point and to the eastward of the range line, where the prevailing depth is 25 feet, there is an obstruction with a least depth of $18\frac{1}{2}$ feet, which appears to be an old anchor.

Wreck.—A sunken wreck lies about 133 yards to the westward of the range line and 1,540 yards 167° (S. by E. $\frac{1}{4}$ E.) from the front range light.

Buoy.—A black spar buoy is moored close to on the northern side of this wreck.

Range lights—Front light.—A fixed white light, 21 feet above water, visible 11 miles, is shown from a white square tower on the north shore of the harbor.

Rear light.—A fixed white light, 36 feet above water, visible 13 miles, is shown from a white square tower attached to a dwelling 317 yards $339^{\circ} 28'$ (NW. by W. $\frac{1}{4}$ W.) from the front light.

These lights form a range leading between Middle Ground and the shoal extending off the eastern entrance point.

Caution.—Vessels approaching from either side should keep at least $1\frac{1}{2}$ miles from the land as long as the range is open.

Anchorage.—The best holding ground is on the eastern side of the harbor.

Do not anchor nearer the northern shore than 880 yards, as the water is shallow and the sea that sets in during southerly gales is only partially broken by the shoals outside.

Docks.—Bram and Anclam Docks are on the western side of the harbor. The latter has been abandoned.

Directions.—Having passed the black spar buoy on the western side of the entrance, keep it bearing to westward of 191° (S. $\frac{1}{4}$ W.) until the red spar buoy on the eastern side of the entrance bears 67° (NE. by E. $\frac{1}{4}$ E.) when the northern end of Middle Ground Shoal will be passed.

Coast Guard station.—A coast guard station is located on the eastern shore northward of the old lighthouse tower.

Mud Bay lies about $1\frac{1}{4}$ miles northeastward of Bailey Harbor and is separated from it by a peninsula. It has a limited area of deep water close to its entrance which affords fairly good anchorage and protection from all winds except those from east to south. There are submerged net stakes in the harbor.

Cana Island lies close inshore just north of Mud Bay.

Light.—A fixed white light, 80 feet above water, visible 17 miles, is shown from a yellow conical tower attached to a dwelling on Cana Island.

North Bay is an indentation $2\frac{1}{4}$ miles north of Cana Island; the coast between is clear and bold. It has only a small area of deep water close to its mouth, which affords good anchorage and protection to small vessels from all but east winds. Entrance to the anchorage area is contracted by shoals extending from the two entrance points.

Buoys.—A black spar buoy marks the extremity of the shoals extending from the southern entrance point.

A red spar buoy marks the extremity of the shoal extending from the northern entrance point.

These buoys are about 660 yards apart.

Directions.—To enter the harbor pass midway between the buoys and round to under either point, according to the direction of the wind, taking care not to run too far in, as the anchorage ground reaches only 1,320 yards from the entrance buoys.

Rowley Bay.—Shoals extend southerly 1 mile from the point west of Spider Islands, and extend 1,320 yards off the east and north shores of Rowley Bay, lying west of this point. The bay affords but little shelter and the anchorage is not good; its north end is fouled by many rocky spots with from 2 to 14 feet of water on them.

Shoals.—The approach to Rowley Bay is obstructed by a shoal extending in a north and south direction for $2\frac{3}{4}$ miles, and lying $1\frac{3}{4}$ miles offshore south of Rowley Bay; near its southeastern point is an exposed gravel bank and numerous rocks awash, north of which the limiting depths on the shoal range from 2 to 12 feet. A detached 3-foot reef is located about 1,100 yards north of the shoal, and a $10\frac{1}{2}$ -foot spot disconnected from the offshore bank lies 1,320 yards from the shore abreast of the middle of the shoal. Vessels should not enter the bay north of the large shoal.

Four-foot Shoal Buoy.—A red spar buoy marks the southeastern point of the shoal in the entrance.

Coast.—From North Bay the shore trends northward to Porte des Morts Passage.

Foul ground.—Along the main shore for about 4 miles to the southward of Porte des Morts Passage the waters are rendered foul by an irregular bottom formation of very shallow banks and detached spots, which attain a maximum reach of about $2\frac{1}{2}$ miles from the shore between Gravel Island and Spider Islands.

Light and bell buoy.—A black conical buoy, showing an occulting white light, is moored in 23 feet off the southeast point of the shoal south of the entrance to Porte des Morts Passage to avoid the numerous outlying shoals in this vicinity.

Fog signal.—The fog signal is made on a bell sounded by the action of the waves.

Caution.—There is but 6 feet of water on a detached shoal within 880 yards to westward inside the light and bell buoy.

Vessels bound through Porte des Morts Passage from southward should pass at least 880 yards to the eastward of the light and bell buoy.

Shoal.—A boulder shoal about 100 feet in diameter on the 21-foot curve, with minimum depth of 17 feet, lies $4\frac{1}{2}$ miles $191^{\circ} 50'$ (S. $\frac{1}{4}$ W.) from Pilot Island Lighthouse and $1\frac{1}{2}$ miles $205^{\circ} 30'$ (SSW.) from Outer Shoal light and bell buoy.

Detached reef.—A detached reef with $10\frac{1}{2}$ feet least depth lies with its northerly end 1,100 yards east-southeasterly from the southerly end of Spider Islands, and then extends 880 yards south-south-west.

CHAPTER XVIII.

GREEN BAY—NORTHERN SHORE OF LAKE MICHIGAN AND ADJACENT ISLANDS, TO THE STRAITS OF MACKINAC AND ROUTES ON LAKE MICHIGAN.

Green Bay.—Green Bay is 118 miles long from the head of Big Bay de Noc, its northern end, to the mouth of the Fox River, its southern end, and its greatest breadth in a northwest and southeast direction abreast of Rock Island Passage is 23 miles.

It is partly separated from Lake Michigan on the east by a peninsula approximately 75 miles long, with an average width of 10 to 12 miles.

Green Bay entrances.—The entrance to Green Bay is about 28 miles wide, but it is obstructed by several islands and submerged reefs and shoals, the channels through which are exceedingly dangerous. From south to north they are named as follows, and will be described in this order: Porte des Morts (Death's Door) Passage, Rock Island Passage, St. Martins Island Passage, and Poverty Island Passage.

Porte des Morts (Death's Door) Passage.—The southerly entrance into Green Bay, known as Death's Door.

There is a strong current setting in or out, according to the direction of the wind, and many vessels have been lost in consequence; it is frequently so strong that sailing vessels can not make headway against it. The coast is rock-bound, and certain destruction awaits the craft going ashore. Sometimes the current is against the wind.

The northern side of the passage is formed by Detroit Island and Plum Island, and the southern side is formed by the mainland of the peninsula. The width is about 3 miles.

Pilot Island.—At the Lake Michigan entrance to the passage is Pilot Island located $1\frac{1}{2}$ miles 233° (SW. $\frac{1}{2}$ W.) from south end of Detroit Island, on the edge of a shoal which is about 440 yards in diameter.

Light.—A fixed and flashing white light, 48 feet above water, visible 14 miles, is shown from a yellow square tower attached to a dwelling on Pilot Island.

Fog signal.—The fog signal is made on a siren.

Plum Island, lying about midway between Washington Island and the south mainland peninsula, is about 1 mile long northwest

and southeast by about 1,100 yards wide. Shoal water borders its west, south, and east sides for 220 to 440 yards, and a small detached 16-foot boulder shoal lies 1,100 yards east of the southeast point of the island and $1\frac{1}{2}$ miles 331° (NNW. $\frac{1}{4}$ W.) from Pilot Island Lighthouse. A 19-foot shoal lies 1,000 yards southeastward of the southeastern extremity of the island. A shoal bank extends out from the north shore.

Buoy.—A black spar buoy is moored about 1,100 yards north of Plum Island to mark the eastern side of a shoal bank extending northward from it.

This buoy may be passed close-to on the eastern side.

Caution.—A narrow ridge with depths of 16 to 20 feet extends north by west 767 yards from the buoy.

Anchorage.—The anchorage between Detroit and Plum Islands is a safe one and is frequently used during easterly gales.

Range lights—Front light.—A fixed red light, 32 feet above the water, visible 13 miles, is shown from a white structure with a square base and octagonal top located on the southwest side of Plum Island.

Rear light.—A fixed red light, 80 feet above the water, visible 16 miles, is shown from a white, square pyramidal skeleton tower located 550 yards 331° (NNW. $\frac{1}{4}$ W.) from the front light.

Fog signal.—The fog signal is made on a steam whistle.

These lights form a guide for entering Porte des Morts Passage.

Waverly and Nine-Foot Shoals.—Waverly and Nine-Foot Shoals are situated, respectively, at the northeast and southeast (or outer) corners of a rock bank with 5 to 18 feet of water, extending about $1\frac{1}{2}$ miles eastward from the mainland on the southerly side of Porte des Morts Passage. Waverly Shoal, with 13 feet least depth, about $1\frac{1}{2}$ miles 262° (W. $\frac{1}{4}$ S.) from Pilot Island Light. Nine-Foot Shoal, with 5 feet least water, is about 660 yards southerly from Waverly Shoal.

Bell buoy.—A black bell buoy is moored on the eastern side of Waverly Shoal.

A black spar buoy is moored alongside the bell buoy.

Buoy.—A black spar buoy marks the easterly extremity of Nine-Foot Shoal.

Coast Guard and storm warning stations.—A coast-guard station is located on the northeast corner of Plum Island. Day and night storm warnings are displayed from a steel tower 56 feet east of the coast-guard station.

Caution.—Along the mainland for about 4 miles to the southward of Porte des Morts Passage, the waters are rendered foul by an irregular bottom formation of very shallow banks and detached spots,

which attain a maximum reach of about $2\frac{1}{2}$ miles from the shore between Gravel Island and Spider Islands.

Detroit Island.—This long, narrow island, lying to the southward of Washington Island, is practically part of it, as very shoal water connects the two. Continuous shoal ground extends between them with depths of from 2 to 7 feet up to Detroit Harbor on the south side of Washington Island.

A bank with 3 or 4 feet available depth connects the northeasterly side of Detroit Island with the southeasterly entrance point of Detroit Harbor, Washington Island; this bank diminishes proceeding along the east shore of Detroit Island toward the south point, from which a rocky shoal reaches $\frac{1}{2}$ mile to the southeast. Off the west side of the island, reefs with 9 to 10 feet depth and having deeper water inside them, parallel the shore at a distance of $\frac{1}{2}$ mile out.

Middle Shoal, about 880 yards long northwest and southeast and 440 yards wide, having a depth of 9 feet lies between Detroit and Plum Islands. It is nearly connected with the former by a spit. Vessels should not attempt to pass between the shoal patch and Detroit Island.

Buoy.—A red spar buoy marks the southwestern side of Middle Shoal.

Detroit Island Passage.—This passage lies between Detroit Island on the north, and Plum and Pilot Islands on the south, and can be used, but great care is necessary to avoid the shoals off Detroit and Plum Islands. It is frequently used as an anchorage during easterly gales, and is a safe one.

Washington Island is the largest island in the Green Bay outlet, being about 6 miles in greatest length north and south by about $5\frac{1}{2}$ miles greatest width east and west. The north and west shores of the island are bluff, with deep water close-to. In the north shore near the west side is Washington Harbor, bounded on the west by a hilly peninsula terminating in Boyer Bluff, which is deep-to. The harbor has good water with bold shores, affording good anchorage and protection from all winds except those from north-northwest to northeast. Jackson Harbor, in the northeast corner of the island, is too shoal for any but light-draft vessels. The east shore of the island is bordered by a shoal stretch generally about 1,100 yards wide, but which, at about the middle of the island, extends offshore $1\frac{1}{2}$ miles, with depths of 12 or 13 feet at the outer edge; on this latter shoal is situated Hog Island. A small reef with 10 feet of water on it lies 1,100 yards southeast of the southeast point of Washington Island.

Detroit Harbor.—Detroit Harbor is a shallow indentation in the west side of the south shore of Washington Island, having an avail-

able depth of 8 feet. In the mouth of this harbor is the northerly end of Detroit Island.

Buoy.—A perpendicularly striped black and white spar buoy, moored in 10 feet, marks the entrance from Detroit Island Passage.

Rock Island, Wis., is located $4\frac{1}{2}$ miles south-southwest of St. Martin Island and just off the northeast corner of Washington Island, with which it is connected by a shallow bank. The west, north, and east sides of the island are steep-to.

Pottawatomie Light, fixed white, 159 feet above water, visible 18 miles, is shown from a gray square tower attached to a dwelling, on the northwest point of Rock Island.

Fish Island and Fisherman Shoal.—About 2 miles east-southeast of the southeast point of Rock Island lies Fish Island, surrounded by a rocky reef $1\frac{1}{2}$ miles long north and south by 1,100 yards wide. About $1\frac{1}{2}$ miles south-southwest of Fish Island and $1\frac{1}{4}$ miles south-southeast of the southeast point of Rock Island is Fisherman Shoal, with only 2 feet least water on it and extending about $1\frac{1}{2}$ miles in a northwest and southeast direction. Both reefs are menaces to vessels using Rock Island Passage. The channel between these reefs and Washington and Rock Islands is deep.

Light and bell buoy.—A red conical buoy, showing a flashing white light, is moored in 36 feet on the southeastern edge of Fisherman Shoal.

Fog signal.—The fog signal is made on a bell sounded by the action of the waves.

Rock Island Passage.—**St. Martin Island Shoals** lie to southward of St. Martin Island and on the northeasterly side of Rock Island Passage. The shoalest spot, with only 8 feet of water, lies 2 miles 198° (S. by W. $\frac{1}{4}$ W.) from the southeast point of St. Martin Island and 3 miles 60° (NE. by E. $\frac{1}{4}$ E.) from Pottawatomie (Rock Island) Light, with a 9-foot spot 660 yards 16° (N. by E. $\frac{3}{8}$ E.) from it. From the 8-foot spot a narrow shoal with depth increasing to 20 feet extends 660 yards 213° (SSW. $\frac{7}{8}$ W.). A detached shoal, with least depth of 14 feet, lies $3\frac{3}{4}$ miles 68° (ENE.) from Pottawatomie Light.

Buoy.—A red nun buoy marks the southern extremity of St. Martin Island Shoals.

Light buoy.—A red cylindrical buoy, showing an occulting red light, is moored in 34 feet on the southeast point of the detached shoal eastward of St. Martin Island Shoal.

A red spar buoy is moored alongside.

St. Martin Island, is a wooded and hilly island $2\frac{1}{4}$ miles long north-northwest and south-southwest by $1\frac{1}{2}$ miles in greatest width, narrowing to about 440 yards at its southeast end, from which a narrow spit projects southward to a point $1\frac{1}{2}$ miles from shore, with

15 feet of water near its outer end. The other shores of this island are deep-to.

Light.—A flashing alternating red and white light, 84 feet above water, visible 17 miles, is shown from a white, hexagonal tower on the northeastern end of St. Martin Island.

Fog signal.—The fog signal is made on a steam whistle.

St. Martin Island Passage.—This passage is included between Gravelly and the Gull Islands on the east and St. Martin Island on the west side. Entrance through the St. Martin Island Passage is made on a 320° (NW. $\frac{1}{4}$ N.) course starting from a point 880 yards south of Little Gull Island Light and bell buoy and passing about 1,100 yards off the light.

Gull Island and Gravelly Island are on northwesterly side of St. Martin Island Passage and the southwesterly side of Poverty Island Passage, separating the latter from St. Martin Island Passage. Gull and Little Gull Islands are situated on the north and south ends, respectively, of a shoal about 1 mile long north and south by 1,320 yards wide, with depths of 3 or 4 feet, lying about $2\frac{1}{4}$ miles west-southwest of Poverty Island and $1\frac{1}{4}$ miles east of the north end of St. Martin Island. About 1,320 yards north by west from Gull Island is Gravelly Island, surrounded by shallow water, which is almost in continuation of that on which the Gull Islands are located. The channel between the two has about 18 feet available depth.

Buoy.—A red spar buoy is moored in 40 feet off the west side of the shoal area about west by north from the northern end of Gull Island.

Light and bell buoy.—A red cylindrical buoy, showing an occulting white light, is moored in 54 feet off the south point of the shoal.

Fog signal.—The fog signal is a bell sounded by the action of the waves.

Gravelly Island Shoal is about 1 mile north of Gravelly Island and has $15\frac{1}{2}$ feet of water on it, and on a line between the island and shoal are two spots with $14\frac{1}{2}$ and $15\frac{1}{2}$ feet depths.

Buoy.—A black spar buoy marks the north side of Gravelly Shoal.

Caution.—Owing to the spots just mentioned, only light-draft vessels should undertake to pass south of the buoy.

Poverty Island is situated on the northeastern side of Poverty Island Passage about 1 mile southwest of the southern end of Summer Island, the available channel between the two being contracted to about 440 yards in width by the Summer Island Spit, the good water being nearer to Poverty Island; this channel should not be attempted without local knowledge. The east and south sides of the island are clear to within 400 yards and the west side, marked by a hill, is deep-to.

Light.—A flashing red light, 80 feet above water, visible 17 miles, is shown from a white conical tower connected to a dwelling on the southern end of Poverty Island. This light will show flashing white during the winter.

Fog signal.—The fog signal is made on a steam whistle.

Poverty Island Shoal lies with its north end $2\frac{1}{4}$ miles 303° (NW. by W.) from the northwest point of Poverty Island, and has least depth of $14\frac{1}{2}$ feet on it.

Buoy.—A red spar buoy is moored about 880 yards south of the shoal spot.

Poverty Island Passage, about $2\frac{1}{4}$ miles wide, lies between Gravelly and Gull Islands and Poverty Island, and is almost free from shoals.

Directions.—Vessels bound into Green Bay should pass 1,320 yards south of the light and immediately shape their course to pass between the spar buoys marking Poverty Island Shoal and Gravelly Island Shoal.

Summer and Little Summer Islands are the most northerly islands in the Green Bay outlet, situated south of the end of the northerly mainland peninsula whose southeasterly extremity is Point Detour. These islands are hilly and wooded, lying about $1\frac{1}{2}$ miles apart in a northwest and southeast direction, connected by a sandy and stony flat, which also reaches across to the mainland, and on which there are depths of 2 or 3 feet between the two islands and 6 feet between them and the mainland. From the west side of Little Summer Island shoals reach offshore over 1 mile, and Rocky Island lies about 880 yards offshore in this shallow area.

Little Summer Island Shoal, with 8 feet least depth, lies about 1 mile 239° (SW. by W. $\frac{1}{4}$ W.) from the south point of Little Summer Island. A shoal extends about 1 mile to the south from the south end of Summer Island, with 15 feet depth at its end.

Rocky Island, about 660 yards long east and west, lies about 440 yards west of Little Summer Island on the shoal bank extending from it.

Eastern shore of Green Bay.—**Deathdoor Bluff** is the northwest point of the southern mainland peninsula separating Green Bay from Lake Michigan. A detached 15-foot spot lies about 1,600 feet northwesterly off the bluff. To the east of the bluff is Hedgehog Harbor, with deep water and sheltered from the south. The harbor is inclosed on the east by Table Bluff. The whole north shore of the peninsula is deep-to around into Porte des Morts Passage.

Ellison Bluff forms the southwesterly boundary of Ellison Bay, which lies south of Deathdoor Bluff and opens to the north and northwest. It has steep shores, and affords protection from south and east winds.

Whaleback Shoal, in the middle of Green Bay, about on a line from Porte des Morts Passage to Cedar River, lies $6\frac{1}{2}$ miles 305° (NW. by W.) from Deathdoor Bluff. It is $1\frac{1}{2}$ miles long northwest and southeast by 1,100 yards in greatest width, with only 4 feet of water over it about midway of its length. Except in clear weather, great care is necessary in approaching the locality.

Light and bell buoy.—A red cylindrical buoy, showing a flashing white light, is moored in 18 feet on the southwest point of Whaleback Shoal.

Fog signal.—The fog signal is made on a bell sounded by the action of the waves.

Coast.—From Ellison Bluff to Sister Bay, a distance of $4\frac{1}{2}$ miles, the general direction of the coast is south, and is steep-to except about halfway, where a reef runs out from shore in the direction of the Sister Islands, rendering the channel between unsafe.

Sister Bay is open to the northward and westward. Its shores are steep-to, but it has a $11\frac{1}{2}$ and 12 foot shoal in the middle of its entrance.

Sister Islands, off the north point of Sister Bay, are very small and have shoals extending 1,540 yards northwest and southeast and 880 yards wide. They are 1,320 yards from shore.

Sister Shoals, three small shoals with 3 feet of water over them, lie about $1\frac{1}{2}$ miles off the south point of the entrance to Sister Bay. The outermost two of these shoals are in range with Sister Islands and bear 218° from them.

Horseshoe Reefs are $2\frac{1}{2}$ miles westward of Sister Islands, and have a least depth of 3 feet. They are 2 miles long northeast and southwest, the southerly end being $2\frac{1}{2}$ miles northwestward of Eagle Bluff.

About 880 yards north by east from the reefs is a patch with 16 feet least depth.

A 21-foot rock lies between.

Buoy.—A red nun buoy marks the southeasterly point of the reef. Vessels must pass eastward of this buoy.

Little Sister Bay lies westward of Sister Bay; the coast between is clear.

Horseshoe Island lies off the entrance to Eagle Harbor $\frac{1}{2}$ mile northeast of Eagle Bluff. The shoals around the island do not extend more than 220 yards from it.

Eagle Harbor is eastward of Eagle Bluff, and affords good anchorage except in north or northwest gales.

Excepting the head of the bay, off the town of Ephraim, where shoals extend 1,540 yards from shore, the shore can be approached to within 440 yards. There are some 17 and 18 foot spots in the deep area farther out.

A detached 16-foot shoal lies in the middle of the harbor entrance.

Coast.—From Eagle Harbor the coast trends westward and around a point of land to the western extremity of Eagle Bluff.

Eagle Bluff Light, fixed white, 76 feet above water, visible 13 miles, is shown from a yellow square tower attached to a dwelling on the extreme western point of the bluff.

It is a guide through Strawberry Passage, between the islands and the main shore.

Strangers should not attempt to pass between the Strawberries and Chambers Island.

Strawberry Islands are small detached islands about 1 mile westward of Eagle Bluff Light. They are surrounded by shoals which extend 3 miles in a north and south direction, the northeast and southeast ends of which are marked by red spar buoys.

Strawberry Channel Northeast Buoy, a red spar, is moored in 24 feet of water to mark the eastern edge of the shoals.

Strawberry Channel Southeast Buoy, a red spar buoy, is moored in 13 feet of water to mark the southeast end of Strawberry Shoals.

The channel here is quite narrow, affording no passage for vessels drawing over 15 feet, and the buoy must be passed close-to to avoid the offshore shoal.

Chambers Island is located about in the middle of Green Bay, to the westward of the Strawberry Islands. On its easterly face it is about $3\frac{1}{4}$ miles long, contracting toward the west side, which is about $1\frac{1}{2}$ miles long; the island is 2 miles wide. Shoals extend 880 to 1,540 yards off the shores of the northerly portion of the island.

Light.—A fixed and flashing white light, 68 feet above water, visible 16 miles, is shown from a yellow octagonal tower attached to a dwelling on the northwestern extremity of Chambers Island. This light is a guide through the western passage between the island and the west shore of Green Bay.

Shoals.—At the southwest corner a shoal with 16 to 17 feet depth projects to the westward $1\frac{1}{2}$ miles.

Hanover Shoal.—A very shallow spit runs 2 miles southeasterly from the southeast point of the island, and a detached shoal with 9 feet least water lies off the east side $1\frac{1}{2}$ miles northeast by north from the southeast point. Strangers should not attempt to pass between Chambers and the Strawberry Islands.

Light and bell buoy.—A black conical buoy, showing an occulting white light, is moored in 24 feet at the extremity of the shoal extending westward from Chambers Island.

Fog signal.—The fog signal is made on a bell sounded by the action of the waves.

Hat Island.—The coast between Eagle and Egg Harbors is steep-to, except Fish Creek Bay, 6 miles north of Egg Harbor, which is shoal. Hat Island is north-northwest of Egg Harbor and $2\frac{1}{4}$ miles offshore. Shoals extend 880 yards east and southeast from it.

Detached Shoals.—A detached shoal 440 yards square lies 1 mile south-southwest of Hat Island. Another with $14\frac{1}{2}$ feet on it lies $1\frac{1}{2}$ miles northeast of Hat Island.

Egg Harbor, about 12 miles northeast of Sturgeon Bay, is 880 yards wide by 1,320 yards long. It is a good harbor except in northerly and northwesterly gales.

Coast.—From Egg Harbor to Sturgeon Bay the coast is bold and may be approached to within 440 yards. At Monument Point two shoals make out for 880 yards northwest and southwest, and several detached shoals, about 1 mile off the coast, extend for $1\frac{1}{2}$ miles to the northward.

Monument Shoal, with a least depth of 8 feet, lies $1\frac{1}{2}$ miles southwest of Monument Point. The shoal is about 600 yards long east-northeast.

Buoy.—A black spar buoy is moored in 18 feet of water to mark the most westerly point of shoal off Monument Point; least depth, 8 feet, lies about 220 yards east-northeast of buoy. Shoals with from 8 to 14 feet of water lie 2 miles east-northeast of buoy.

Caution.—Vessels bound to the northward should keep 2 miles offshore and not head to the eastward of Eagle Bluff Lighthouse until at least 3 miles beyond the buoy.

Shoal.—About 1 mile south of Monument Shoal and about 1,320 yards offshore is a detached shoal with 10 feet of water on it.

Green Island is a wooded island situated 8 miles 308° (NW. $\frac{1}{4}$ W.) from Monument Point, and is 660 yards long west-northwest and east-southeast. It is clear to within 220 yards of its southerly face, and to within 440 yards on its northerly side; but a reef extends west from the northwesterly end for 1,320 yards, and from the south-easterly end a spit extends to the southeast for 880 yards.

Light.—A fixed white light, 57 feet above water, visible 15 miles, is shown from a yellow square tower attached to a dwelling near the southeast part of Green Island.

Buoys.—A black spar buoy marks the outer end of the reef extending westward from Green Island.

A red spar buoy marks the outer end of the reef extending south-eastward from Green Island.

Sturgeon Bay is of importance as having at its head the canal leading into Lake Michigan. This bay runs south-southeast and affords good anchorage, and is the real harbor of refuge to which

the artificial harbor and canal (on the west shore of Lake Michigan) give access.

Light.—A fixed white light with a red flash, 61 feet above water, visible 15 miles, is shown from a red square tower attached to a dwelling located on Sherwood Point on the south side of the west entrance to the bay.

Fog signal.—The fog signal is made on a bell.

Shoal.—Shoal ground extends from the easterly shore of the bay across toward the western shore in the vicinity of Quarry Point and Hills Point.

Light buoy.—A black spar-shaped buoy, showing an occulting white light, is moored in 19 feet on the eastern side of the channel marking the northwesterly corner of the shoal.

A black spar buoy is moored alongside the light buoy.

Quarry Point Shoal.—A small shoal, with 8 feet on it, extends northeastward from Quarry Point and is in the entrance to Sawyer Harbor.

Buoy.—A red spar buoy marks the eastern edge of this shoal.

Dredged channel.—There is a 19-foot dredged channel, through the shoal extending from the eastern shore of the bay, with Hills Point marking its northwestern extremity.

Light buoy.—A black conical buoy, showing an occulting white light, is moored in 20 feet on the eastern side of the dredged channel at its northern end opposite Hills Point.

A black spar buoy is moored alongside the light buoy.

Buoy.—A black spar buoy marks the southeasterly entrance point of the dredged channel.

A red spar buoy marks the westerly side of the channel. It is moored about 400 yards southeasterly of Hills Point.

Dunlap Reef is the shoalest portion of the Middle Ground which extends about 1,100 yards in a north-northwesterly direction from the Ahnapsee & Western Railroad Bridge at the village of Sturgeon Bay. The channel to the draw of the railroad bridge passes eastward of the Middle Ground

Range lights—Front light.—A fixed red light, 17 feet above water, visible 9 miles, is shown from a red octagonal tower, attached to a dwelling, on Dunlap Reef.

Rear light.—A fixed red light, 39 feet above water, visible 10 miles, is shown from a white, square tower on a dwelling 236 yards 153° (SSE. $\frac{1}{2}$ E.) from the front light.

This range leads through the dredged channel abreast Hills Point. Only mariners possessing local knowledge should make use of it.

Buoys.—The limits of the Middle Ground are marked by a red and black spar at the outer or northerly extremity, a red spar on the

easterly side abreast of the front range light, a red and black spar at the inner or southerly end of the shoalest portion (Dunlap Reef), and a black spar on the west side.

Daymark.—Hills Point Daymark, a white, triangular, slatted target, apex up, on Hills Point, marks the point abreast of which vessels bound for the canal should leave the Dunlap Reef Range and head for Sturgeon Bay Bridge Light.

Bridge light.—A fixed white light, 65 feet above water, visible 16 miles, is shown from a gray square skeleton tower on top of the bridge on the center draw of the railroad and traffic bridge.

Note.—Sturgeon Bay Canal and the harbor of refuge entering from Lake Michigan are described in Chapter XI.

Directions.—After passing Sherwood Point Lighthouse and Quarry Point Buoy, which is on the eastern side of the shoal off the entrance to Sawyers Harbor, bring the lights on Dunlap Reef in range and stand on until abreast the daymark on Hills Point, when head for Sturgeon Bay Bridge Light. There is good water in the channel west of Dunlap reef, but the turn around the southern end is too sharp for vessels bound through the canal.

Caution.—Vessels from the southward bound for Sturgeon Bay should give this part of the coast a berth of 2 miles and not change course into Sturgeon Bay until the light on Sherwood Point bears 141° (SE. $\frac{3}{4}$ S.), or to the southward of this bearing.

Town.—The town of Sturgeon Bay is on the north shore near the head of the bay, about 5 miles from the mouth and 4 miles from the southeast entrance of the canal.

A shipyard and dry dock, coaling station, weather-display station, deputy collector of customs, telegraph and long-distance telephone facilities, several lines of tugs to assist vessels into and through the canal, and numerous other conveniences that are necessary adjuncts to a first-class harbor of refuge are located here. The population is 4,553 (1920).

Snake Island is $4\frac{1}{2}$ miles southeast of Sherwood Point Light. It is a small circular island surrounded by shoals. From the head of the bight, between it and Sherwood Point, a long shoal spit extends northward, and there are several detached shoals about $1\frac{1}{2}$ miles offshore between the island and the point. The most northerly of these detached shoals is abreast Sturgeon Bay.

Buoy.—A red and black spar buoy marks the most northerly of these detached shoals.

Little Sturgeon Bay, about $5\frac{1}{2}$ miles southwest of Sturgeon Bay, is a small shallow bay, open to the northward. It is about 1 mile wide at the entrance and 2 miles long. The deepest water is in the

eastern half of the bay, the depths varying from 7 to 14 feet. Just east of the bay is a small bight with an average depth of 13 feet.

Coast.—From Little Sturgeon Bay to Red River Bluff the shore is steep-to. Between Red River Bluff and Red Banks there are no shoals outside the distance of 1,320 yards except two outlying spots with 16 and 19 foot depths are at points $1\frac{1}{2}$ and 2 miles, respectively, from the shore and 3 miles northeasterly of Red Banks. From Red Banks all the south shore of Green Bay is shoal.

Green Bay Harbor.—This harbor comprises the Fox River below Depere, a section about $6\frac{1}{2}$ miles long discharging into the southern end of Green Bay about 1 mile below Green Bay city, and an entrance channel about $4\frac{1}{2}$ miles long dredged through the shoals in the head of the bay from the river mouth out to the 19-foot curve. In the river the lower 3 miles extending through the city of Green Bay is a naturally deep pool, requiring no improvement, and the upper $3\frac{1}{2}$ miles thence to Depere is dredged channel connecting at its head with a turning basin at Depere.

Outer Light Buoy No. 1A, black, spar shaped, showing an occulting white light, is moored in 21 feet on the west end of the 18-foot shoal about $2\frac{3}{4}$ miles northeast of Tail Point Lighthouse.

A spar buoy is moored alongside the light buoy.

Outer Light and Bell Buoy No. 2, red, conical, showing an occulting red light, is moored in 21 feet at the turning point, to enter the dredged channel leading to Fox River.

A spar buoy is moored alongside.

Fog Signal.—The fog signal is made on a bell sounded by the action of the waves.

Revetments.—The east revetment at Grassy Island is 235 yards long, and the west revetment 207 yards long, with a uniform width between them of 220 feet. Their direction is about north-northeast.

Channels.—The improved channels are fairly stable in character, but occasional dredging is necessary to maintain the required depths. There are no special dangers or difficulties attending the navigation of either the outer or inner channels; both are well defined by buoys and the outer channel is amply lighted.

The 18-foot channel extending from the mouth of Fox River into Green Bay is about 4.4 miles long, varying in width as follows: From the mouth of the river to the north side of Grassy Island, a distance of $1\frac{1}{2}$ miles, 200 feet wide; then a little over 1 mile to Sable Point Bar, 220 feet; then 867 yards through Sable Point Bar, gradually widening to 500 feet; then about 1.2 miles, 500 feet wide, the direction of this last section being about northeast by east.

In the river the pool extending through the city of Green Bay has a natural depth of from 25 to 40 feet. The dredged 15-foot channel

in the river below Depere and above Green Bay city is about $3\frac{1}{2}$ miles long and 150 feet wide.

Turning basin.—The turning basin at Depere is about 350 yards long, with width of about 500 feet at the north end, and 650 feet at the south end, and a depth of 15 feet.

Tail Point Light, fixed white, 38 feet above water, visible 13 miles, is shown from a buff cylindrical lantern on a dwelling mounted on a crib, on the western side of the channel.

Fog signal.—The fog signal is made on an air whistle.

East Bank Light Buoy No. 1, spar shaped, showing an occulting white light, is moored in 18 feet on the eastern side of the turn in the dredged channel. A black spar buoy is moored alongside it.

West Bank Light Buoy No. 6, red, spar shaped, showing an occulting red light, is moored in 20 feet at the elbow of the dredged channel. A red spar buoy is moored alongside it.

Grassy Island Lower Light, fixed white, 27 feet above water, visible 12 miles, is shown from a white, square, pyramidal tower, on the northern end of the channel pier.

Grassy Island Upper Light, fixed white, 34 feet above water, visible 12 miles, is shown from a white, square, pyramidal tower, on the southern end of the channel pier.

Caution.—Grassy Island lights are not range lights; if used as such they will lead a vessel ashore. They only mark the position of the channel piers.

Elbow Light, flashing white, 17 feet above water, visible 10 miles, is shown from a gray post on the east bank of the dredged channel.

West Bank Light Buoy No. 20, red, cylindrical, showing a flashing red light, is moored in 18 feet at the elbow of the channel near the mouth of the Fox River. A spar buoy is moored alongside it.

Murphys Dock Light, fixed white, 18 feet above the water, visible 10 miles, is shown from a white lamp house on red piles located on the east side of the mouth of the Fox River.

Buoys.—The eastern side of the dredged channel from the mouth of the Fox River to deep water is marked by eight black spar buoys; the western side is marked by nine red.

Directions.—When at a point about 220 yards 270° (W. $\frac{1}{4}$ S.) of Green Bay Harbor Outer Light Buoy No. 1A bring Murphys Dock Light to bear 212° (SSW. $\frac{1}{4}$ W.), stand on that course, passing eastward of Outer Light and Bell Buoy No. 2, until the ruins of the stone lighthouse tower on Long Tail Point bears 279° (W. $\frac{1}{4}$ N.), when change course to 237° (SW. $\frac{1}{4}$ W.), passing southeastward of the red spar buoy No. 2A and Tail Point Light. When abreast and westward of East Bank Light Buoy No. 1 haul to southward and follow the

buoyed channel until West Bank Light Buoy No. 20 is passed, when the deep water at the mouth of the river will be reached; then the midchannel for Green Bay City may be taken.

Above Green Bay the dredged channel to Depere is indicated by red spar buoys placed along its westerly edge. Also, two black spar buoys mark the east side of this channel at the lower and upper ends, one a short distance below the Chicago & North Western Railroad Bridge and the other near the turning basin at Depere.

Harbor rules and regulations are prescribed by the local authorities. Mariners should obtain a copy of these regulations and carefully comply with them.

City.—The city of Green Bay is situated at the southwestern extremity of Green Bay on the right bank of the Fox River at its mouth. It has a good harbor and great facilities for navigation. The industries comprise saw and flour mills, soap works, manufacturing of canned goods, paper, machinery, furniture, etc. Large quantities of lumber, grain, and fish are exported. The city contains a courthouse, various academic institutions, and many elegant residences. The population is 31,017 (1920).

The former town of Fort Howard, now a station of Green Bay, lies opposite on the west bank of the river.

Bridges across Fox River below Depere.

No'	Location and name.	Kind.	Draw openings—clear width.			Clear height above low-water datum.	Remarks.
			Right. ¹	Left. ¹	Center.		
FOX RIVER.							
1	Kewaunee, Green Bay & Western R. R. and Chicago & North Western Ry. (Eastman Avenue).	Railway..	Feet. 90	Feet. 90	Feet. -----	Feet. 9	See Note 1.
2	Main Street.....	Highway..	63.5	62.5	-----	7.4	Do.
3	Walnut Street.....	do.....	-----	-----	80	10	Bascule. 1 leaf. See Note 2.
4	Mason Street.....	do.....	-----	-----	90	10.4	Bascule. See Note 2.
5	Chicago, Milwaukee & St. Paul Ry. (Porlier Street).	Railway..	75	75	-----	9	See Note 1.
6	Manitowoc, Green Bay, & North Western Ry. (about 3,550 feet above Porlier Street).	do.....	75	75	-----	30	Do.
EAST RIVER.							
7	Monroe Avenue.....	Highway..	60.125	60.125	-----	5.5	See Note 3.
8	Chicago, Milwaukee & St. Paul Ry. (Elm Street).	Railway..	60	60.3	-----	5.3	See Note 4.
9	Webster Avenue.....	Highway..	60.	-----	-----	7.8	Left draw inaccessible. See Note 5.
10	Chicago, Milwaukee & St. Paul Ry. (Cedar Street).	Railway..	-----	60	-----	6.4	See Note 4.
11	Main Street.....	Highway..	-----	-----	60	8.1	Bascule. See Note 2.
12	Pleasant Street.....	do.....	40	-----	-----	8.3	See Note 6.
13	Mason Street.....	do.....	40	40	-----	7.7	Do.
14	Manitowoc, Green Bay & North Western Ry. (about 4,200 feet above Mason Street).	Railway..	-----	-----	-----	15.3	Fixed bridge; above head of navigation.

¹ Looking downstream toward the lake.

Note 1.—One red light on each side and one on each end of protection piling of center pier; one red light on each end of protections to abutments; three lights on top of center of bridge show red up and down stream when bridge is closed, and green when bridge is open.

Note 2.—One light on each side of free end of leaf shows red when bridge is closed and green when open; one red light on each end of left abutment; one red light on each end of protection to right abutment. Bridge No. 11 also has one red light on each end of right abutment.

Note 3.—Right draw not available. One light on top of center of bridge shows red up and down stream when bridge is closed and green when bridge is open; one white light on each approach to pier looking downstream, and one red light on right approach pier and one white light on left approach pier looking upstream.

Note 4.—Right draw not available. One light on top of bridge above pivot pier shows red up and down stream when bridge is closed and green when bridge is open; one red light on each corner of channel side of center pier; one red light on each corner of left approach pier.

Note 5.—Two red lights on draw span, one on each side, above pivot pier; four white lights, one on each corner of each approach pier.

Note 6.—Left draw not accessible. Not lighted; seldom opened.

Bridge Signals.—The local tug men have adopted a system of whistle signals for the different bridges, as follows:

For bridges over Fox River: Main Street, 2 short, 1 long (— — —); Walnut Street, 1 long, 2 short (— — —); Mason Street, 1 long, 1 short, 1 long (— — —).

Railroad bridges and East River bridges, 3 long (— — —).

Closed hours for East River bridges.—By resolution of the mayor and council of the city of Green Bay, dated July 27, 1916, the bridges over East River at Monroe Avenue, Webster Avenue, and Main Street are required to be closed and not opened for marine traffic between the hours of 6.40 and 7 a. m., 12 m. and 12.30 p. m., 12.40 and 1 p. m., and 6 and 6.20 p. m.

Depere.—The town of Depere is about 5 miles above Green Bay City, on the Fox River. There are twelve red spar buoys marking the west line of the channel of Fox River between the two places. The two channels have a combined length of about 7 miles, and 14 feet may be carried to the town. Depere has paper and flour mills, manufactures of skiffs and launches, knitted goods, bricks, cigars, and foundries and machine shops. The population is 5,165 (1920).

Coast.—From Long Tail Point, Green Bay Harbor, to Pensaukee River, a distance of about 17 miles, the western shore of Green Bay is lined with rocky flats making out from 2 to 3 miles, with irregular depths of from 18 feet on the outer edge to 3 feet near the shore. The 21-foot curve lies from $3\frac{1}{4}$ to $4\frac{1}{4}$ miles offshore along this stretch of coast.

Pensaukee Harbor is at the mouth of Pensaukee River, on the west shore of Green Bay and about 20 miles from its southerly end. The harbor has depths of 7 to 9 feet for a width of 30 feet.

Pensaukee Shoal extends out about 3 miles, just to the northward of the Pensaukee River, in a southeasterly direction, with only 3, 4, and 5 feet of water over it.

Oconto Bank.—This shoal is about $2\frac{1}{2}$ miles long in a north and south direction and about 880 yards wide at its widest part. It lies about 3 miles offshore between Pensaukee Point and the mouth of the Oconto River and has 12 feet on its southern end and 17 feet on its northern end.

Wreck.—The steamer *Sydney C. McLouth* lies about $4\frac{1}{2}$ miles 176° (S. $\frac{1}{2}$ E.) from Oconto South Pierhead Light. Soundings showed a depth of 3 feet over the bow, 6 feet over the boiler, and 19 feet alongside the wreck. The wreck lies close to the edge of the offshore bank between the Oconto and Pensaukee Shoals and out of the course of general navigation, but is an obstruction to fishing craft running out of Oconto Harbor.

Buoy.—A red spar buoy is moored about 70 yards eastward of the wreck.

Oconto Harbor is situated at the mouth of Oconto River, on the west shore of Green Bay about 26 miles from the southerly end. The city of Oconto is about 2 miles up the river; below Oconto the river traverses a belt of low, swampy ground, the elevation of which is but slightly above the surface of the river. Inside the shore ends of the piers the banks of the river are generally unprotected by revetments, and bars form in the wide portions of the channel from scour in the narrower parts during severe freshets.

The town has flour mills, a cannery, and an important fish trade.

Piers.—The north pier is 450 yards and the south pier 733 yards long; they project beyond the shore line 347 yards and 553 yards.

respectively, in a direction about $54^{\circ} 20'$ (NE. $\frac{1}{2}$ E.). There is a uniform clear width between the piers of 140 feet.

Channel.—The entrance channel extends from the 15-foot curve in Green Bay about west by south for about 483 yards, then about south by west between the piers for 733 yards to the turning basin, which extends up river about 267 yards and has a maximum width of 125 yards.

Soundings taken in June, 1920, indicated that the channel had a controlling depth of about 12 feet and the basin a depth of 6 feet.

The river has a navigable depth of about 7 feet for a distance of about 1 mile from its mouth, and about 3 feet for the next mile, which is expected to be increased to 14 feet by the city.

Light.—A flashing white light, 31 feet above water, visible 11 miles, is shown from a white skeleton tower on a concrete base on the eastern end of the south pier.

Light and bell buoy.—A cylindrical buoy showing an occulting white light is moored in 20 feet to mark the south side of the entrance of the outer dredged channel.

Coast.—About 4 miles to the northward of the mouth of the Oconto River the coast makes a sharp turn to the eastward for 8 miles to the mouth of the Peshtigo River, with shoals extending offshore from 1 to 3 miles.

Peshtigo Shoal extends out 3 miles from Peshtigo Point in a southeast direction. It is $1\frac{1}{2}$ miles wide at the point and 1,320 yards at the extremity and has only 3 feet of water at its outer end.

Peshtigo Reef Lightvessel, shows a fixed white light, 25 feet above water, visible 13 miles. It has a black hull, two masts, black circular grating at the foremast head, "Peshtigo" on both sides. It is moored in 72 feet off the southeast point of the reef, in (approx.) lat. $44^{\circ} 57' N.$, long. $87^{\circ} 34' W.$

Fog signal.—The fog signal is made on an air chime whistle.

Peshtigo River has three small islands at its mouth. It is 150 miles in length and there is a small village at its mouth.

Coast.—From Peshtigo Point to Menominee River, a distance of about 8 miles, the coast takes a general northerly direction with shoal water extending out about $1\frac{1}{2}$ miles.

Menekaunee Shoal extends out about 2 miles in a southeasterly direction from Menekaunee Point, on the south side of the entrance to the Menominee River, with only 4 feet of water on its eastern edge.

Buoy.—A red nun buoy moored in 28 feet of water marks the eastern end of the shoal.

State boundary line.—The Menominee River is the boundary line between Wisconsin and Michigan; Menekaunee and Marinette,

on the south bank of the river, being in Wisconsin and Menominee in Michigan.

Menominee Harbor and River.—The Menominee River discharges into Green Bay about 16 miles northwesterly from the mouth of Sturgeon Bay; for a distance of 150 miles it forms the boundary between Michigan and Wisconsin. The river is navigable only to a dam about 2 miles above the mouth, and this portion is the commercial harbor for Menominee, Mich., and Marinette, Wis. The land in the vicinity has an elevation of but a few feet above the lake surface.

Piers.—The north pier is 618 yards and the south pier 904 yards long; they are nearly parallel, bearing about 244° (SW. by W. $\frac{1}{2}$ W.), and project beyond the shore line 353 yards and 717 yards, respectively; the clear width between them at the entrance is 123 yards and at the shore line 133 yards. The inner 228 yards of the north pier and 201 yards of the south pier are no longer essential for preservation of the channel and these lengths are therefore not being maintained. At the inner end of the south pier and on the same line there is a shore extension of about 123 yards length, built by the Menominee River Lumber Company.

Channel.—The entrance channel, which is 200 yards wide outside the piers and 100 yards wide between them, extends 244° (SW. by W. $\frac{1}{2}$ W.) from the 18-foot curve in Green Bay to a point about 667 yards inside of the outer ends of the piers, where the river channel, having a width of 100 yards to Ogden Street Bridge and of 67 yards above that bridge, extends 288° (WNW. $\frac{3}{4}$ W.) for a distance of about 1.2 miles to the Marinette municipal wharf.

There is a depth of 18 feet throughout the channel up to the Marinette municipal wharf.

Above the Marinette municipal wharf, the depths in the part of the channel and the turning basin vary from 18 feet to 12 feet, with shoal spots in the turning basin having less than 5 feet of water. Saw logs partly or entirely submerged are liable to damage propeller wheels or flat-bottom craft, especially in the abandoned channel and connecting slips.

Shoals.—Outside the pierheads, in the prolongation of the entrance channel the depth is 19 feet and upward, but on the southerly side of the approach an extensive bank makes up from the south.

A small pile of rock and sand, apparently a dump or the wreck of a loaded barge, with a minimum depth of $12\frac{3}{4}$ feet and 30 feet of water surrounding it lies 0.8 mile 42° (NE. $\frac{1}{2}$ N.) from Menominee Pierhead Light. It is near the course taken by steamers bound for lower lake ports. Another spot with 17 feet depth lies about 667 yards northeast of the pierhead light.

Buoys.—A black spar buoy marks the shoal bank on the southerly side of the approach.

A red spar buoy marks the 12½-foot shoal northeastward of the harbor entrance.

Range lights—Front light.—A fixed red light, 34 feet above water, visible 10 miles, is shown from a red octagonal tower on the north pier.

Rear light.—A fixed red light, 59 feet above water, visible 15 miles, is shown from a red skeleton tower 248 yards 245° (SW. by W. & W.) from the front light.

The lights indicate the direction of the entrance.

Fog signal.—The fog signal is made on a steam whistle.

Anchorage.—Good anchorage may be obtained to the northwestward of Menominee Light, where the shore turns to northward.

Bridge.—A highway bridge connects Main Street, Menominee, with Ogden Street, Marinette. It has a clear height of 17½ feet above low-water datum and clear width of 70 feet in each draw opening. There is a red light on each end of the draw piers; a red light on each side of turntable; a red light on each end of draw protection pier; three lights on top of draw span show red up and down stream when bridge is closed and green when open. Signal for opening draw, 3 blasts (— — —); a bell on the bridge sounds return signals.

City.—The city is situated on the northern side of the Menominee River and has considerable frontage on Green Bay. The principal exports are canned goods, cement, brick, lime, grain, iron ore, lumber, and miscellaneous merchandise; imports coal, fruits, vegetables, pig iron, steel rails, stone, sand, and miscellaneous merchandise.

The population, 5,104 (1920).

Storm warnings.—Day and night signals are displayed from a flagstaff on the roof of the fire-engine house near the bay shore about 1,200 yards northward of the north pier.

Railroads.—The Chicago, Milwaukee & St. Paul and the Chicago & North Western railroads run into the town.

Coast.—From the Menominee River to Cedar River, a distance of 25 miles, the coast trends in a regular northeast by north direction. Shoal water extends 880 yards to 1½ miles from shore. About 5½ miles below Cedar River there is a 9-foot spot 1 mile from shore with deep water close-to.

Cedar River is a small lumber town with a population of about 400, situated at the mouth of the Cedar River.

Cedar River Light, fixed white, 66 feet above water, visible 14 miles, is shown from a white, square, pyramidal tower on the western side of the entrance.

Piers.—The east pier is 251 yards long and the west pier 100 yards long; they project beyond the shore line 251 yards and 92 yards, respectively. The distance between the piers is 70 yards opposite the

lake end of the west pier and 68 yards opposite the shore end of the east pier.

Channel.—There is a least depth of 13 feet outside on the line of the range lights, with available depths of 8 to 12 feet in the river. The channel is privately maintained.

Middle Ground Shoal lies in the middle of the river between points 493 yards and 383 yards above the pierhead lighthouse, and is about 20 feet wide, with limiting depth of 2 feet.

Shoals.—Six detached shoals, with depths varying from 17 to 21 feet, lie outside of the shoal line east of the harbor entrance.

Range lights—Front light.—A fixed red light, 21 feet above the water, visible 4 miles, is shown from a white post located on the outer end of the west pier.

Rear light.—A fixed red light, 26 feet above the water, visible 4 miles, is shown from white post located on the west pier, 50 yards $340^{\circ} 20'$ (N. by W. $\frac{1}{4}$ W.) from the front light.

Buoy.—A black spar buoy is moored in the approach westward of the line of the range lights in 9 feet of water.

Bridge.—About 667 yards from the shore end of the harbor piers a bridge spans the river, having a clear width of 25 feet in each draw and a clear height of superstructure above the water surface of 10 feet. It is not lighted for navigation purposes, being above the head of general navigation.

Coast.—The coast from Cedar River to Ford River, a distance of about 21 miles, takes a general north-northeasterly direction. The 21-foot curve, having many rocks and shoals inside it, lies from 660 yards to $1\frac{1}{4}$ miles offshore along this stretch until within 5 miles of Indian Town. South of Indian Town shoals extend 5 miles, and offshore about 2 miles in an easterly direction. A few detached shoals lie in the bight formed by the main shore and the spit projecting southward from Indian Town. A detached shoal with 18 feet on it lies about 660 yards off the southern extremity of the spit.

Ford River is a lumber manufacturing town at the mouth of the river of the same name; population about 500. There are docks extending out in the lake.

Little Bay de Noc—West shore.—Northeastward of Ford River a sand bank, with depths along its outer edge ranging from 2 to 18 feet, makes out from shore, decreasing from 4 miles in width off the mouth of Ford River to 440 yards at Sand Point, about $6\frac{1}{4}$ miles to the northeast. On this bank, about $2\frac{1}{4}$ miles below Sand Point, is situated Portage Island, a narrow ridge about 2 miles long and practically connected with the main shore. The entrance to the bay is about 3 miles wide and has a depth sufficient for the largest vessels.

Escanaba is situated on Sand Point. The port has four large iron-ore docks fitted with all the modern improvements. There are

also large merchandise docks, and the coal and fish trades are also important. The population is 13,103 (1920).

Escanaba Light, fixed red, 44 feet above water, visible 13 miles, is shown from a white square tower attached to a dwelling near the extremity of Sand Point.

Fog signal.—The fog signal is made on a bell.

Buoy.—A black spar buoy marks the outer extremity of the shoal extending northeasterly from Sand Point.

Light.—A fixed red light, 32 feet above water, visible 6 miles, is shown from a white freight house on the end of the Stephenson Dock. This light is privately maintained.

Storm warnings.—Day and night signals are displayed from a steel tower a short distance north of Ludington Street and west of Tilden Avenue.

Gladstone Harbor.—Between Sand Point (at Escanaba) and Saunders Point (Gladstone), $7\frac{1}{2}$ miles northward, the shore curves to the west, with shallow water along it extending out a maximum distance of 1,100 yards. The harbor is of natural formation, consisting of an indentation of the bay, protected by a projecting point of land so as to be completely landlocked and affording safe moorings for vessels at all times. The commerce of Gladstone, which is important, is almost entirely with Lake Erie ports, and the largest vessels on the Lakes arrive at this harbor.

Light.—A flashing red light, 23 feet above water, visible 6 miles, is shown from a small, white house on piles in 8 feet about 65 yards north of the outer end of Saunders Point.

Buoy.—A black spar buoy marks the outer edge of the shoal extending from the northern side of Saunders Point.

Harbor.—The portion of the bay constituting Gladstone Harbor has generally deep water, although shoals in places interfere with the free movement of vessels. Saunders Point Light and a black spar buoy, as previously described, mark, respectively, the easterly and northerly limits of the shoal water around the entrance point. In the angle between the docks on the south side of the harbor and the formerly projecting Soo ore dock (now abandoned and partially removed), there is a bank with least depth of 3 feet, with a dredged channel of 17 feet and upward along the face of the docks and on both sides of the Soo ore dock. Deep water is available up to the Cleveland Cliffs Iron Co. dock in the northerly portion of the harbor.

There has been no shoaling of consequence over the dredged area since completion of the project.

Caution.—A wooden intake pipe laid by the city of Gladstone extends from the shore near the outer end of Saunders Point, just west of the inner angle on the south side, 500 yards 166° (S. by E.

½ E.) ; its outer end is nearly on a line between Saunders Point Light and Squaw Point Light. Vessels are cautioned not to anchor in the vicinity of this pipe.

Town.—The town of Gladstone is situated on Saunders Point.

Storm warnings.—Day and night signals are displayed from a flagstaff on the roof of the elevator, "Soo Line" dock.

Head of bay.—Northward of Squaw Point the deep water approaches generally to within 660 yards of the shore for a distance of about 5 miles. Above this, shallow water fills the entire head of the bay and borders the westerly shore for a width of 1,320 yards, thence to Gladstone Harbor. Owing to their respective projections, Saunders Point on the west shore of the bay (at Gladstone) is directly north of Squaw Point on the east shore and there is a deep channel between the two. They form above Saunders Point, a landlocked anchorage having good depth over mud bottom.

The Whitefish, Rapid, and Tacoosh rivers, the first used only for logging and the latter two only small creeks, empty into the head of Little Bay de Noc through a common channel which lies between two long points of shoals extending a long distance out from the west shore of the bay at Masonville and from the east shore opposite. This channel is narrow and tortuous, and all information indicates that the bottom of the channel, under a covering of gravel and clay, is flat rock at a depth of 8 feet or so at ordinary stages.

Eastern shore.—The east shore from Peninsula Point to the next point north should not be approached within 1,320 yards; then the coast is deep to up to Stonington, 1½ miles farther north. For a distance of 2½ miles north of Stonington the shoal border is generally less than 880 yards wide, but from there to Squaw Point there is a flat with only 3 to 12 feet of water over it, extending offshore 2 miles at its southerly limits and gradually receding to Squaw Point.

Light buoy.—A red conical buoy, showing an occulting white light, is moored in 20 feet on the southwest point of the shoal extending from the shore between Stonington and Squaw Point. A red spar buoy is moored alongside.

Light.—A flashing white light with a red sector, 40 feet above water, visible white 13 red 10 miles, is shown from a buff octagonal tower attached to a dwelling, on Squaw Point. (See Light List.)

Main channel.—The main channel in Little Bay de Noc permits the passage of the deepest draft vessels on the lakes, being from 24 to 60 feet in depth. The vessel course in entering passes between Escanaba Light on Sand Point on the west side and the red gas buoy marking the outer corner of the shallow offshore bank on the east side, and after proceeding farther northward the channel to the upper part of the bay opens between Squaw Point Light on the east side and Saunders Point Light on the west side at Gladstone.

Peninsula Point is the narrow termination of the peninsula separating Big and Little Noc bays. The whole point is surrounded by shoals, which extend south and east from the point $1\frac{1}{2}$ miles. This shoal is rocky, is known as Peninsula Point shoal, and has only 1 foot of water over it 1,320 yards south of the lighthouse. East of the light shoals extend for $1\frac{1}{2}$ miles, with depths ranging up to 15 feet.

Light.—A flashing white light, 40 feet above water, visible 13 miles, is shown from a yellow square tower attached to a dwelling on the south end of Peninsula Point.

Buoy.—A red spar buoy marks the end of the shoal extending $1\frac{1}{2}$ miles southward from Peninsula Point.

Eleven-Foot Shoal lies $2\frac{1}{2}$ miles 196° (S. by W. $\frac{1}{2}$ W.) of Point Peninsula Light. It is a detached shoal, least water $5\frac{1}{2}$ feet, with deeper water all around, but vessels should not pass to the north of the buoy, and it is safest to pass south of Eleven-foot Shoal Lightvessel before standing up Little Bay de Noc.

There is a small spit with 14 feet over it 880 yards eastward of the Eleven-foot Shoal.

Buoy.—A red nun buoy marks the southwestern side of Eleven-foot Shoal.

Detached shoals.—There are seven detached shoals with 20 and 21 feet over them lying about 1 mile eastward of Eleven-foot Shoal. Also many detached shoals with 20 and 21 feet on them lie between Eleven-foot and Corona Shoals to southward, rendering navigation between them very hazardous.

Eleven-foot Shoal Lightvessel shows a fixed white light, 40 feet above water, visible 13 miles. It has a black hull, black circular daymark on the foremast, "11 Foot" on both sides. It is anchored in 60 feet to the southward and westward of Eleven-foot and Corona Shoals, in approximately lat. $45^\circ 36' N.$, long. $86^\circ 58' W.$

Fog signal.—The fog signal is made on a steam whistle.

Submarine bell.—There is a submarine bell on the lightvessel.

Caution.—Vessels bound for Little Bay de Noc should not attempt to pass northward of the lightvessel.

Corona Shoal is $3\frac{1}{2}$ miles 175° (S. $\frac{3}{4}$ E.) from Peninsula Point Light. The shoal has its greatest extent, 275 yards, in a north-northeast and south-southwest direction. The least water, $12\frac{1}{2}$ feet, is northeastward of the buoy.

Buoy.—A red and black spar buoy marks the southern end of Corona Shoal.

Minneapolis Shoal is a small rocky shoal lying $6\frac{1}{2}$ miles 192° (S. by W. $\frac{1}{4}$ W.) from Peninsula Point Light. The center of the shoal, with 15 feet least water, is marked by a buoy, and vessels should give it a berth of at least 440 yards.

Buoy.—A red and black horizontally striped buoy marks the center of the shoal.

Detached shoal.—A detached shoal with 20 feet on it lies close northward of Minneapolis Shoal.

North Drisco Shoal is a mound of bowlders about 200 feet in diameter, with least depth of 16 feet, situated $1\frac{1}{2}$ miles 323° (NW. $\frac{3}{4}$ N.) from the northern end of Drisco Shoal and $2\frac{1}{2}$ miles 150° (SSE. $\frac{1}{2}$ E.) from Eleven-foot Shoal Lightvessel.

Two detached shoals with 21 feet on them lie about half way between Minneapolis and North Drisco Shoals.

Drisco Shoal is $7\frac{1}{2}$ miles 176° (S. $\frac{3}{4}$ E.) from Peninsula Point Light. It is nearly 440 yards in extent northeast and southwest, and has a least depth of 16 feet.

Buoy.—A red and black horizontally striped can buoy is moored in 19 feet water and marks the northeastern point of Drisco Shoal.

Caution.—These shoals are outlying and being nearly in the track of vessels bound from the Porte des Morts and Rock Island Passages to Escanaba, make them dangerous in thick weather, as the soundings in the vicinity can not be depended upon to give warning of an approach.

Big Bay de Noc.—A peninsula extending south from the mainland divides the north end of Green Bay into Big Bay de Noc and Little Bay de Noc. The entrance to Big Bay de Noc, between Burnt Bluff and Peninsula Point, due west, is 12 miles wide. The head of Big Bay de Noc is further divided into two smaller bays, the eastern one $6\frac{1}{2}$ miles deep, from a line joining Stony and Ansel's Points, and the western one, known as Ogontz Bay, is $2\frac{1}{2}$ miles deep, northwestward of Indian Point. In the eastern arm shoal water makes out for $2\frac{1}{2}$ miles from the shore as far south as Jacks Bluff, with depths varying from 5 and 6 feet near shore to 16 and 17 feet abreast Jacks Bluff. Southeast from Stony Point, on the west, for 2 miles, and for the same distance eastward and northward to the head of the arm, and clear around to Valentine Point, on the east shore, the water is shoal; 14 to 16 feet will be found about 1 mile from shore from Stony Point around to Valentine Point. A sandy shoal, 1 mile north and south and 440 yards east and west, with 17 feet over it, lies midway between these points.

West shore.—The west shore of the bay is shoal; off St. Vital Point the shoal extends eastward $1\frac{1}{2}$ miles and includes St. Vital Island. This island is small and surrounded by shoal, which connect it with the west shore in all directions and extend eastward 880 yards, narrowing the deep-water channel in Ogontz Bay. Between the point and the island is a narrow strip with only 2 to 5 feet of water over it, and immediately south of this shoal, and parallel to it, at a distance of 440 yards is a second narrow strip with only 1 to 2

feet over it. Between these two shoals there are depths of 13 to 15 feet, due east of the point and extending 880 yards to the eastward and southward of the point toward the shore. Off Crystal Point $1\frac{1}{2}$ miles to the southward of St. Vital Point, shoals make out to the eastward for about 1 mile. From here south to Chippewa Point shoals extend out from 440 yards to 1 mile in some places. From Chippewa Point to Peninsula Point they extend about 1 mile offshore except in the bight just east of the point, where they extend for 2 miles from shore, though outside of 880 yards from the coast, this bight has depths of 13 to 16 feet and is sheltered from the north and west.

Round Island, small and triangular, is 3 miles off the west shore of the bay and about midway between St. Vital and Chippewa Points. The island is surrounded by shoals which extend north in detached patches $1\frac{1}{4}$ miles. Midway between Round Island and Crystal Point is another shoal, with 4 to 6 feet over it.

Ripley Shoal, with 2 feet least depth on it is about 1 mile long and lies 1 mile north-northeast of Round Island.

Ogontz Bay is about $2\frac{1}{2}$ miles long, from Indian Point northward, and about the same width. It is quite shallow, though 16 and 17 feet is obtained between Indian Point and the point opposite. Northward it shoals rapidly to the head of the bay, the depths averaging 7 to 9 feet to within 440 yards from shore.

North shore.—All the north shore of the bay is shoal for some distance, and between Stony and Indian Points a rocky spit extends southward 6.6 miles. This spit separates the deep water in the east head of Big Bay de Noc from that in Ogontz Bay and is 4 miles wide on the north, gradually tapering to 1,320 yards at its southern point, $2\frac{1}{4}$ miles east from Round Island.

Buoy.—A black spar buoy marks the end of the spit extending from the north shore.

Nahma is a small village on the shore west of Stony Point and at the mouth of Sturgeon River. It is a terminus of the Nahma and Northern Railroad, and contains the lumber mills and docks of the Bay de Noquet Co. Five lumber docks extend about 150 yards into the bay, with about 15 feet depth alongside and between them, except on the west side of the west dock where the water is shoal.

Light.—A fixed white light, 25 feet above water, visible 6 miles, is shown from an unpainted post on the outer end of the dock, N-O, east of the mouth of the Sturgeon River at Nahma.

East shore.—The east shore, which has several indentations, has, besides, Burnt Bluff, Middle Garden, and Jacks Bluffs. Vessels navigating this portion of the bay should keep close to the westward of a line joining Burnt and Garden Bluffs, which will carry clear to the beginning of shoal water off Valentine Point. On this shore

are South River Bay, south of Garden Bluff, and Garden Bay, between Garden Bluff and Ansels Point. Both these bays are shoal.

From Brunt Bluff the coast curves around to the southeastward to Point Detour, a distance of $5\frac{1}{2}$ miles.

Point Detour, is the north point of entrance to Green Bay. It is a narrow, wooded, peninsular point projecting to the southeast into the lake, and has shoal water projecting southward from it for 1,100 yards.

NORTHERN SHORE LAKE MICHIGAN FROM POINT DETOUR TO POINT LA BARBE.

Coast.—From Point Detour to the first point north which is marked by a high hill, a distance of $4\frac{1}{2}$ miles, the coast takes a north by east direction and is clear of all danger. Off this first point a shoal makes out southeasterly for nearly 1 mile. From this point to Portage Bay, 6 miles farther north, there are several indentations in the land. The coast is generally clear and bold, with shoals extending not more than 880 yards from shore.

Two shoals with $17\frac{1}{2}$ and $18\frac{1}{2}$ feet on them lie about 6 miles northeast of Point Detour and $3\frac{1}{2}$ miles from the shore.

Portage Bay is open to the southward. From the west side of the bay shoals extend for 1,320 yards from shore, and from the east side dangerous 4 and 8 foot shoals extend 2 miles to the southeastward. The shoal water at the head of this bay extends 880 to 1,320 yards from shore.

Between Portage Bay and Parent Bay, a distance of about 4 miles, there are several exposed rocks, midway between, about 1,320 yards offshore:

Parent Bay, westward of Point aux Barques, is full of detached, rocky, dangerous shoals $1\frac{1}{2}$ miles from shore, and these continue to and around Point aux Barques at 1,320 yards from shore.

Detached shoals.—There are three detached shoals, the inner one with 12 feet lying 1,100 yards, the middle one with 13 feet lying 1,320 yards, and the outer one with 10 feet of water lying $1\frac{1}{2}$ miles, respectively, from Point aux Barques in a southeasterly direction.

Wiggins Point.—Rocky shoals make out for 2 miles to the eastward and southward from this point, which is 4 miles north of Point aux Barques, with depths of from 2 to 4 feet only in places to the eastward, 10 feet on the southern edge, and 14 and 15 feet on the northern edge. On the eastern edge, nearest the buoy, is one patch with 12 to 14 feet of water over it. The greatest width of this shoal is $2\frac{1}{2}$ miles in a north-northwest and south-southwest direction.

Light and bell buoy.—A red conical buoy, showing an occulting white light, is moored in 30 feet on the east end of the shoal off Wiggins Point.

A red spar buoy is moored alongside.

Fog signal.—The fog signal is made on a bell sounded by the action of the waves.

Coast.—From Wiggins Point to Manistique Light, a distance of $7\frac{1}{2}$ miles, the coast takes a general north-northeasterly direction, with shoal water making out from 880 yards to 1 mile in places. A little westward of Manistique the coast takes a sharp turn to the eastward.

Manistique Harbor is at the mouth of the Manistique River. To the westward Escanaba, in Green Bay, is distant by water about 66 miles, to the eastward St. Ignace is distant about 80 miles, and to the southeastward Charlevoix is distant about 65 miles.

Shoal.—A rocky shoal with 18 feet least depth lies in the harbor approach 1,633 yards, $203^{\circ} 54'$ (SSW. $\frac{1}{2}$ W.), from the light on the end of the east breakwater.

Caution.—Vessels approaching the harbor should avoid the shoals lying off the point east of the entrance to the river.

Breakwater and piers.—The breakwater is 274 yards long, with its outer end about 353 yards southerly from the west revetment head at the river mouth and running thence in an east-northeasterly direction. The new east pier, 313 yards long, extends from the east end of the breakwater north by east to the shore about 43 yards east of the old east pier. The new west pier is about 493 yards long, with its shore end about 433 yards westerly from the river mouth; thence it bears south-southeasterly to a point in the prolongation and 333 yards from the end of the west revetment. The clear width of entrance between the outer ends of the west pier and the breakwater is 108 yards. The inclosed basin, with area of 31.2 acres, does not afford anchorage ground or mooring facilities for vessels.

At the mouth of the river the Government revetment on the west side is about 125 yards long, extending about 50 yards beyond the present shore line. The old stub pier on the east side projects about 50 yards beyond the present shore line. These structures are about 187 yards apart at their outer ends, converging inward, with least width of about 87 yards between their inner ends.

Channel.—From the entrance between the breakwater and west pier the Government channel extends north-northeastward for 475 yards to the inner end of the west revetment, and thence in the river north-northwestward for 492 yards. The car-ferry slip is located about 133 yards above the inner end of the west revetment. There is a depth of 18 feet throughout the channel.

Above the Government channel there are a number of wharves with channels between, the important ones being dredged for a distance of about 833 yards to accommodate vessels drawing 12 to 14

feet. A dam across the river about 1 mile from the mouth constitutes the head of navigation.

To the southward and abreast of the easterly half of the breakwater there is an area of bare ledge rock with from 9 to 20 feet of water over it.

Lights.—A flashing white light, 36 feet above water, visible 10 miles, is shown from a white skeleton tower on the south end of the west breakwater.

A fixed white light, 26 feet above water, visible 8 miles, is shown from a white post on the end of the west pier.

A fixed red light, 50 feet above water, visible 14 miles, is shown from a red square pyramidal tower on the east breakwater near the outer end.

Fog signal.—The fog signal is made on a diaphone.

Radio.—A radio station is operated all the year by the United States Navy; call letters NUB; working distance 150 miles.

Radio compass station.—A radio compass station is under construction.

Coast.—The coast from Manistique to Seul Choix Point, a distance of 16 miles, trends in a general easterly direction, with shoal ground extending out from 880 yards to 1 mile from shore.

Caution.—Vessels bound for Manistique from the eastward should not get northward of a long joining Seul Choix Point with Manistique Breakwater Light.

Seul Choix Point projects into the lake 2 miles in a southeasterly direction. Its southwest face is quite steep-to, with many exposed rocks close to shore.

Shoal.—A shoal spit, with 20 feet on its outer extremity, extends 1,100 yards to southeastward from Seul Choix Point.

Light.—A fixed white light, 80 feet above water, visible 17 miles, is shown from a white conical tower connected to a red brick dwelling on Seul Choix Point.

Fog signal.—The fog signal is made on a steam whistle.

Coast.—From Seul Choix Point the coast curves in to the northward for a distance of about 3 miles and then to the eastward as far as Patterson Point, a distance of about 11 miles. All this coast is shoal for some distance offshore, with numerous rocks, and should not be approached within 1 mile.

From Patterson Point the coast trends in a northwesterly direction for about 10 miles and is filled by an extensive plat which extends off, 880 yards easterly from Patterson Point, 2½ miles about the middle of the stretch and receding to within 880 yards of the shore at the northern end of the stretch.

The coast then gradually turns to eastward to Mille Coquins Point; this stretch has deep water to within 880 yards or less from the

shore except for a rocky spot with 10 feet on it lying $1\frac{3}{4}$ miles 266° (W. $\frac{1}{4}$ S.) from Mille Coquins Point.

Lansing Shoals embrace a number of bowlder shoals under 24 feet in depth, whose westerly limits are due north of the west tangent of Squaw Island. The shoalest spot, which is just northerly of the light vessel, is a bowlder with 14 feet of water on it, $6\frac{1}{2}$ miles 133° (SE. $\frac{1}{2}$ E.) from Patterson Point and $4\frac{1}{2}$ miles 14° (N. by E. $\frac{3}{4}$ E.) from Squaw Island Light. The other shoals are within $1\frac{1}{2}$ miles in a northwesterly direction from this spot and are 17 feet and upward in depth.

Lansing Shoals Lightvessel, shows a fixed red light, 30 feet above water, visible 10 miles. It has a red hull, 2 masts, red oval daymark on the foremost, "Lansing" on both sides. It is anchored in 33 feet southward of the 14-foot shoal spot, in approximately lat. $45^{\circ} 54' N.$, long. $85^{\circ} 33' W.$

Fog signal.—The fog signal is made on a steam whistle.

Submarine bell.—There is a submarine bell on the lightvessel.

Detached shoals.—Two shoal spots with $19\frac{1}{2}$ and $20\frac{1}{2}$ feet over them, lie $3\frac{1}{2}$ miles 81° (E. $\frac{1}{2}$ N.) and $4\frac{1}{2}$ miles 96° (E. $\frac{1}{2}$ S.), respectively, from Patterson Point.

Potter Reef, with 3 feet least depth, lies $6\frac{1}{2}$ miles 72° (ENE. $\frac{1}{2}$ E.) from Patterson Point. It is about 1,100 yards long east and west, 440 yards wide, and unmarked.

Mille Coquins Inner Reef consists of detached spots with 7 and 14 feet least depths, extending over 1 mile east and west, located about 5 miles southerly from Mille Coquins Point and $2\frac{1}{2}$ miles 67° (ENE. $\frac{1}{2}$ E.) from Potter Reef.

A shoal spot, with 15 feet on it, lies 880 yards west of it and an 18-foot spot 440 yards south of it.

Mille Coquins Outer Reef, with 10 feet least depth, is about 1 mile southeast of Mille Coquins Inner Reef and $3\frac{3}{4}$ miles 84° (E. $\frac{3}{4}$ N.) from Potter Reef. A bowlder shoal with depth of 20 feet lies $1\frac{1}{2}$ miles 157° (S. by E. $\frac{1}{2}$ E.), and a detached 16-foot spot about 2 miles 20° (SSW.) from Mille Coquins Outer Reef. A 21-foot shoal lies $1\frac{1}{2}$ miles 251° (WSW. $\frac{3}{4}$ W.) from the outer reef. These reefs and shoals are out of the regular path of vessels and are unmarked.

Naubinway Island.—About 1,100 yards south of Mille Coquins Point is Naubinway Island, surrounded with rocks and shoal water, the latter extending 1,320 yards in an east-southeasterly direction from the island, with spots of 3 to 7 feet depth near the outer end.

Naubinway Reef, a rocky shoal with 15 feet least water, lies $1\frac{3}{4}$ miles 146° (SSE. $\frac{1}{2}$ E.) from the island, and about halfway between the two is an 18-foot spot with deep water surrounding. A detached 16-foot spot lies 1,320 yards southwest of Naubinway Island.

Naubinway, a small settlement just north of Mille Coquins Point, has a lumber dock, the available depths at which are 10 to 13 feet; the bottom of the harbor and in the vicinity of the dock is soft mud.

Shoals in approach.—A boulder shoal with least depth of $7\frac{1}{2}$ feet, about 167 yards long north and south by 67 yards wide, bears 41° (NE. $\frac{1}{4}$ N.) 1,400 yards from the north end of Naubinway Island, and 119° (SE. by E. $\frac{1}{4}$ E.) 767 yards from the end of the lumber dock.

A boulder shoal with least depth of $16\frac{1}{2}$ feet, about 167 yards long east and west by 67 yards wide, bears 52° (NE. $\frac{3}{4}$ E.) 1 mile from the north end of Naubinway Island, and 102° (ESE. $\frac{3}{4}$ E.) 1,300 yards from the end of the lumber dock.

A detached boulder shoal with least depth of $3\frac{1}{2}$ feet, about 133 yards long east and west by 50 feet wide, bears 30° (NNE. $\frac{3}{4}$ E.) 1.1 miles from the north end of Naubinway Island, and 67° (ENE. $\frac{1}{4}$ E.) 1,133 yards from the end of the lumber dock. The spit off Mille Coquins Point extends out to a point 967 yards 20° (N. by E. $\frac{1}{2}$ E.) from the north end of Naubinway Island and 1,133 yards 170° (S $\frac{3}{4}$ E.) from the end of the lumber dock, and has close to its outer end a boulder with a least depth of $7\frac{1}{2}$ feet.

Directions.—The harbor may be approached from the southeast with no less depth than 18 feet by steering on Mille Coquins Point 302° (NW. by W.), until the refuse burner bears 331° (NNW. $\frac{1}{4}$ W.), then heading for the burner until within 333 yards of the end of the dock.

Coast.—Between Mille Coquins and Biddle Points is a small bay having general depths of 14 feet and over, and shallow water lying within a distance of 660 yards from the shore.

Between Biddle Point and Point Epoufette the shore is irregular and much broken, and the outlying waters contain many shoals and rocks with 18 feet or less water on them, reaching out 3 miles in the bight east of Biddle Point and decreasing to a little over 1 mile west of Point Epoufette.

Pelkie Reef lies with its northerly end $2\frac{1}{2}$ miles 254° (WSW. $\frac{3}{4}$ W.) from Point Epoufette, having 14 feet depth at this end, from which it extends southwesterly about 1,320 yards; the least depth on the reef is 2 feet.

A shoal of crescent shape, about 400 yards long north and south and 50 yards wide on the 18-foot curve, rising abruptly from about 35 feet of water, lies $1\frac{1}{2}$ miles 247° (WSW. $\frac{1}{4}$ W.) from Pelkie Reef. The shoal is covered with cobble stones and small boulders, and near the center there is an area about 100 feet in diameter with from 10 to 12 feet of water generally, and a least depth of about $5\frac{1}{2}$ feet

on one boulder. From the center of the shoal Biddle Point bears 309° (NW. $\frac{3}{4}$ W.) and Point Epoufette bears 67° (ENE. $\frac{1}{4}$ E.).

Fagan Reef, 4 miles long east and west and 2 miles wide, consists of numerous shoals under 24 feet with a least depth of $15\frac{1}{2}$ feet at its westerly end. The $15\frac{1}{2}$ foot spot lies $9\frac{3}{8}$ miles 167° (S. by E.) from Biddle Point and $9\frac{1}{4}$ miles 223° (SW. $\frac{1}{4}$ S.) from Point Epoufette.

Simmons Reef, with a depth of 21 feet or less, lies about 9 miles 184° (S. $\frac{1}{2}$ W.) from Point Epoufette. It is about $2\frac{1}{2}$ miles long east and west and about $1\frac{1}{4}$ miles wide with a central depth of $1\frac{1}{2}$ feet and patches of very shallow water scattered well over the entire area.

This area is dangerous in that the shoal rises quickly from deep water to a flat covered with large boulders in the center, which is the reef proper; there is a very marked drift.

Light and bell buoy.—A red conical buoy showing an occulting white light is moored in 26 feet on the south end of Simmons Reef.

Fog signal.—The fog signal is made on a bell.

Epoufette Point, a narrow peninsula about 1,320 yards long, forms the western shore of the inlet. Just off the point are two small rocky islands.

Coast.—From Point Epoufette to Point aux Chenes, a distance of $16\frac{1}{2}$ miles, the coast trends southeast, receding slightly between these points. For about one-half this distance shoals extend out from 1 mile to $1\frac{1}{2}$ miles; beyond this the coast is steep-to and may be approached within 440 yards.

Manitou Paymen Shoal.—About $3\frac{1}{4}$ miles offshore at a point about halfway between Point Epoufette and Point aux Chenes is Manitou Paymen Shoal, with least depth of about 1 foot and an extent of about 1 mile both north and south and east and west. A boulder about 10 feet in diameter and with least depth of 19 feet, lies in 30 feet of water 1,540 yards 144° (SE. by S.) from Manitou Paymen Shoal Buoy; in its exposed position the boulder forms a menace to navigation.

Buoy.—A red and black spar buoy marks the southerly edge of Manitou Paymen Shoal.

White Shoal is composed of irregular rocky reefs under 19 feet, extending $1\frac{3}{8}$ miles in a northeasterly and southwesterly direction. The least depth is $\frac{1}{2}$ foot on the southwestern end and is 6 miles 151° (SSE $\frac{1}{2}$ E.) from the center of Simmons Reef.

Light.—A flashing white light, 125 feet above water, visible 20 miles, is shown from a white conical tower with a narrow black band in 20 feet on the eastern end of White Shoal.

Fog signal.—The fog signal is made on a steam whistle. If the whistle is disabled a hand horn will be sounded.

Buoy.—A red and black spar buoy marks the southeastern extremity of the shoal.

Shoal.—A shoal spot with 20 feet on it lies $1\frac{1}{2}$ miles northwest of the red and black spar buoy.

For description of Straits of Mackinac see Chapter XV.

ROUTES ON LAKE MICHIGAN.

Straits of Mackinac to Green Bay and ports northward via Squaw Island.—From a point $1\frac{1}{2}$ miles 0° (N. $\frac{1}{2}$ E.) of old Mackinac Point Light steer 278° (W. $\frac{1}{2}$ N.) for $19\frac{1}{2}$ miles, which should bring White Shoal Light to bear 185° (S. $\frac{1}{2}$ W.) distant 1,500 yards; then steer 275° (W. $\frac{1}{2}$ N.) for 22 miles, which should bring Squaw Island Light to bear 180° (S. $\frac{1}{2}$ W.) distant 3 miles, which is the point of departure for the places for Green Bay and ports northward.

To Manistique.—From a point 3 miles 0° (N. $\frac{1}{2}$ E.) of Squaw Island Light steer 275° (W. $\frac{1}{2}$ N.) for 32 miles, which should bring Manistique breakwater lights to bear 13° (N. by E. $\frac{1}{2}$ E.) distant about $1\frac{1}{2}$ miles; then follow the directions as given in the description of the port.

To Poverty Island Passage.—From a point 3 miles 0° (N. $\frac{1}{2}$ E.) of Squaw Island Light steer 243° (SW. by W. $\frac{1}{2}$ W.) for $57\frac{1}{2}$ miles, which should bring Poverty Island Light to bear 325° (NW. $\frac{1}{2}$ N.) distant $1\frac{1}{2}$ miles; then steer 305° (NW. $\frac{1}{2}$ W.) through the passage.

To Martin Island Passage.—From a point $1\frac{1}{2}$ miles 145° (SE. $\frac{1}{2}$ S.) of Poverty Island Light steer 243° (SW. by W. $\frac{1}{2}$ W.) for $3\frac{1}{2}$ miles, which should bring St. Martin Island Light to bear 301° (NW. by W. $\frac{1}{2}$ W.) distant $2\frac{1}{2}$ miles, then steer 316° (NW. $\frac{1}{2}$ N.) through the passage.

To Rock Island Passage.—From a point 3 miles 0° (N. $\frac{1}{2}$ E.) of Squaw Island Light steer 240° (SW. by W. $\frac{1}{2}$ W.) for 64 miles, which should bring the light buoy southeastward of Nine-foot Shoal to bear 270° (W.) distant about 1,500 yards, then steer 267° (W. $\frac{1}{2}$ S.) for $10\frac{1}{2}$ miles through the passage.

Straits of Mackinac to Green Bay, ports southward and ports on the eastern shore of Lake Michigan via Grays Light-vessel.—From a point $1\frac{1}{2}$ miles 0° (N. $\frac{1}{2}$ E.) of Old Mackinac Point Light steer 273° (W. $\frac{1}{2}$ N.) for $20\frac{1}{2}$ miles, which should bring White Shoal Light to bear 22° (NNE. $\frac{1}{2}$ E.) distant $1\frac{1}{2}$ miles; then steer 202° (SSW. $\frac{1}{2}$ W.) for 5 miles, passing, between Gray's Reef Light-vessel and the two light buoys marking Middle Shoal; then steer 195° (S. by W. $\frac{1}{2}$ W.) for $4\frac{1}{2}$ miles, which should bring Ile aux Galets

Light to bear 125° (SE. $\frac{3}{4}$ E.), which is the point of departure for the places before mentioned.

To Poverty Island Passage.—From a point $2\frac{1}{2}$ miles 305° (NW. $\frac{3}{4}$ W.) from Ile aux Galets Light steer 239° (SW. by W. $\frac{3}{8}$ W.) for $20\frac{1}{4}$ miles, which should bring Beaver Island Light to bear 0° (N. $\frac{1}{8}$ E.) distant 2 miles; then steer 267° (W. $\frac{1}{4}$ S. for $52\frac{1}{2}$ miles, which should bring Poverty Island Light to bear 325° (NW. $\frac{1}{8}$ N.) distant about $1\frac{1}{2}$ miles; then follow route before given.

To Rock Island Passage.—From a point 2 miles 180° (S. $\frac{1}{8}$ W.) of Beaver Island Light steer 262° (W. $\frac{3}{4}$ S.) for $57\frac{1}{2}$ miles, which should bring the light buoy southeastward of Nine-foot Shoal to bear 270° (W.) distant about 1,500 yards, then follow route before given.

To Sturgeon Bay Canal via route northward of Fox Islands.—From a point 2 miles 180° (S. $\frac{1}{8}$ W.) of Beaver Island Light steer 252° (WSW. $\frac{1}{2}$ W.) for $15\frac{1}{2}$ miles, which should bring the northwestern tangent of South Fox Island to bear 180° (S.) distant $2\frac{1}{4}$ miles; then steer 235° (SW. $\frac{1}{8}$ W.) for $84\frac{1}{4}$ miles when the Pier Head Light should bear 326° (NW. $\frac{1}{8}$ N.) distant about $1\frac{1}{2}$ miles; then steer for entrance.

To Porte des Morts Passage.—From a point $2\frac{1}{2}$ miles 305° (NW. $\frac{3}{4}$ W.) from Ile aux Galets Light steer 232° (SW. $\frac{3}{4}$ W.) for $38\frac{1}{2}$ miles, which should bring South Fox Island Light to bear 0° (N.) distant $1\frac{1}{2}$ miles; then steer 260° (W. $\frac{1}{8}$ S.) for $52\frac{1}{4}$ miles, which should bring up to the light and bell buoy marking outer shoal; then proceed through the passage, the chart and local knowledge being the best guide.

To Sturgeon Bay Canal via route southward of the Fox Islands.—From a point $1\frac{1}{2}$ miles 180° (S.) of South Fox Island Light steer 240° (SW. by W. $\frac{1}{4}$ W.) for $81\frac{1}{2}$ miles, which should bring the pierhead light to bear 326° (NW. $\frac{1}{8}$ N.) distant $1\frac{1}{2}$ miles; then steer for the entrance.

To Sheboygan via route northward of the Manitou Islands.—From a point $1\frac{1}{2}$ miles 180° (S.) of South Fox Light steer 231° (SW. $\frac{1}{2}$ W.) for $14\frac{1}{4}$ miles, which should bring the western side of North Manitou Island in range bearing 180° (S.) distant $5\frac{1}{2}$ miles; then steer 218° (SW. $\frac{3}{4}$ S.) for $128\frac{1}{4}$ miles, which should bring the breakwater light to bear 270° (W. $\frac{1}{8}$ S.) distant 2 miles; then steer for entrance.

To Milwaukee via route northward of the Manitou Islands.—From a point $5\frac{1}{2}$ miles 0° (N.) of the northwestern extremity of North Manitou Island steer 209° (SSW. $\frac{1}{2}$ W.) for $175\frac{1}{4}$ miles, which should bring up to Milwaukee Light vessel; then steer westward for the harbor entrance.

To Point Betsie.—From a point $2\frac{1}{2}$ miles 305° (NW. $\frac{3}{4}$ W.) from Ile aux Galets Light steer 218° (SW. $\frac{1}{2}$ S.) for $59\frac{1}{4}$ miles, which

should bring up to North Manitou Shoal Lightvessel, pass to southward of the lightvessel and steer 231° (SW. $\frac{1}{2}$ W.) for $8\frac{1}{2}$ miles, which should bring South Manitou Island Light to bear 0° (N.) distant 5 miles; then steer 217° (SW. $\frac{3}{4}$ S.) for 21 miles, which should bring Point Betsie Light to bear 90° (E.) distant $4\frac{1}{2}$ miles.

Point Betsie is a point of departure for ports in the southern part of the lake.

To Traverse City.—From a point $2\frac{1}{2}$ miles 305° (NW. $\frac{3}{4}$ W.) from Ile aux Galets Light steer 201° (SSW.) for 43 miles, which should bring Northport Point, Grand Traverse Bay, to bear 320° (NW. $\frac{1}{2}$ N.) distant about 2 miles; then steer 190° (S. by W.) for $23\frac{1}{2}$ miles, which should bring up to the harbor entrance.

To Charlevoix.—From a point $2\frac{1}{2}$ miles 305° (NW. $\frac{3}{4}$ W.) from Ile aux Galets Light steer 187° (S. $\frac{3}{4}$ W.) for $25\frac{1}{2}$ miles, which should bring the entrance light to bear 120° (SE. by E. $\frac{1}{4}$ E.); then steer for harbor entrance.

Point Betsie to Manitowoc.—From a point $4\frac{1}{2}$ miles 270° (W.) from Point Betsie Light steer 236° (SW. $\frac{7}{8}$ W.) for $72\frac{1}{2}$ miles, which should bring Manitowoc Pier Light to bear 270° (W. $\frac{1}{8}$ S.) distant $4\frac{1}{2}$ miles; then steer for entrance.

Point Betsie to Sheboygan.—From a point $4\frac{1}{2}$ miles 270° (W.) from Point Betsie Light steer 225° (SW. $\frac{1}{8}$ S.) for $92\frac{1}{2}$ miles, which should bring the breakwater light to bear 270° (W. $\frac{1}{8}$ S.) distant 2 miles; then steer for the harbor entrance.

Point Betsie to Milwaukee.—From a point $4\frac{1}{2}$ miles 270° (W.) from Point Betsie Light steer 212° (SSW $\frac{1}{4}$ W.) for 137 miles, which should bring up to Milwaukee Lightvessel; then steer westward for the harbor entrance.

Point Betsie to Racine.—From a point $4\frac{1}{2}$ miles 270° (W.) from Point Betsie Light steer 207° (SSW. $\frac{1}{4}$ W.) for 151 miles, which should bring the breakwater light to bear 255° (WSW. $\frac{1}{2}$ W.) distant 3 miles; then steer for the harbor entrance.

Point Betsie to Chicago.—From a point $4\frac{1}{2}$ miles 270° (W.) from Point Betsie Light steer 198° (S. by W. $\frac{1}{2}$ W.) for 203 miles, which should bring up to Chicago Harbor entrance.

Point Betsie to South Chicago.—From a point $4\frac{1}{2}$ miles 270° (W.) from Point Betsie Light steer 195° (S. by W. $\frac{1}{4}$ W.) for 212 miles, which should bring up to the harbor entrance.

Point Betsie to Gary Harbor.—From a point $4\frac{1}{2}$ miles 270° (W.) from Point Betsie Light steer 193° (S. by W.) for $165\frac{1}{2}$ miles, which should bring up to the harbor entrance.

Milwaukee to Sturgeon Bay Canal.—From Milwaukee light vessel steer 13° (N. $\frac{1}{4}$ E.) for $123\frac{1}{2}$ miles, which should bring up to the canal entrance.

Milwaukee to Porte des Morts Passage.—From the light vessel steer 17° (N. by E. $\frac{3}{4}$ E.) for $159\frac{1}{2}$ miles, which should bring up to

the light buoy on Outer Shoal, then proceed through the passage. The chart is the best guide. Local knowledge is necessary.

Milwaukee to Manistee.—From the light vessel steer 41° (NE. $\frac{1}{2}$ N.) for $112\frac{1}{2}$ miles, which should bring the breakwater light to bear 121° (SE. by E. $\frac{1}{4}$ E.) distant 2 miles, then steer for harbor entrance.

Milwaukee to Muskegon.—From the light vessel steer 80° (ENE. $\frac{1}{2}$ E.) for 76 miles, which should bring up to the harbor entrance.

Milwaukee to Grand Haven.—From the light vessel steer 89° (E. $\frac{1}{4}$ N.) for $77\frac{1}{2}$ miles, which should bring up to the harbor entrance.

Milwaukee to South Haven.—From the light vessel steer 120° (SE. by E. $\frac{1}{2}$ E.) for $88\frac{1}{2}$ miles, which should bring up to the harbor entrance.

Milwaukee to Benton Harbor and St. Joseph.—From the light vessel steer 132° (SE. $\frac{3}{4}$ E.) for 92 miles, which should bring up to the entrance.

Milwaukee to Michigan City.—From the light vessel steer 152° (SSE. $\frac{1}{2}$ E.) for 100 miles, which should bring up to the harbor entrance.

Milwaukee to Chicago Harbor.—From the light vessel steer 160° (S. by E. $\frac{1}{4}$ E.) for 18 miles, which should bring Wind Point Light to bear 265° (W. $\frac{1}{2}$ S.) distant $2\frac{1}{2}$ miles; then steer 173° (S. $\frac{1}{4}$ E.) for 62 miles, which should bring up to the harbor entrance.

Chicago to Sturgeon Bay Canal.—From a point about 2 miles 90° (E. $\frac{1}{2}$ N.) from the Chicago Harbor Light steer 4° (N. $\frac{1}{4}$ E.) for 200 miles, which should bring the pierhead light to bear 326° (NW. $\frac{1}{4}$ N.) distant about $11\frac{1}{2}$ miles, then steer for entrance.

Chicago to Porte des Morts Passage.—From a point about 2 miles 90° (E. $\frac{1}{2}$ N.) from the Chicago Harbor Light steer 8° (N. $\frac{1}{2}$ E.) for 233 miles, which should bring up to the light buoy marking Outer Shoal, then steer for the entrance.

Chicago to Manistique.—From a point about 2 miles 90° (E. $\frac{1}{2}$ N.) from the Chicago Harbor Light steer 13° (N. by E.) for $277\frac{1}{2}$ miles, which should bring up to the harbor entrance.

Chicago to Manistee.—From a point about 2 miles 90° (E. $\frac{1}{2}$ N.) from the Chicago Harbor Light steer 18° (N. by E. $\frac{1}{4}$ E.) for 158 miles, which should bring Big Sable Point Light to bear 90° (E. $\frac{1}{4}$ N.) distant $3\frac{1}{2}$ miles, then steer 35° (NE. by E.) for $17\frac{1}{2}$ miles, which should bring Manistee Light to bear 115° (SE. by E. $\frac{1}{2}$ E.), distant 2 miles, then steer for the harbor entrance.

Chicago to Muskegon.—From a point about 2 miles 90° (E. $\frac{1}{2}$ N.) from the Chicago Harbor Light steer 34° (NNE. $\frac{1}{2}$ E.) for $110\frac{1}{2}$ miles, which should bring up to the harbor entrance.

Chicago to Grand Haven.—From a point 2 miles 90° (E. $\frac{1}{2}$ N.) from the Chicago Harbor Light steer 39° (NE. $\frac{1}{2}$ N.) for $103\frac{1}{2}$

miles, which should bring the pierhead light to bear 90° (E. $\frac{1}{4}$ N.), distant about $2\frac{1}{2}$ miles, then steer for the harbor entrance.

Chicago to South Haven.—From a point about 2 miles 90° (E. $\frac{1}{4}$ N.) from Chicago Harbor Light steer 62° (NE. by E. $\frac{3}{4}$ E.) for $73\frac{1}{2}$ miles, which should bring up to the harbor entrance.

Chicago to Benton Harbor and St. Joseph.—From a point about 2 miles 90° (E. $\frac{1}{4}$ N.) from Chicago Harbor Light, steer 73° (ENE. $\frac{1}{4}$ E.) for $56\frac{1}{2}$ miles, which should bring up to the harbor entrance.

Chicago to Michigan City.—From a point about 2 miles 90° (E. $\frac{1}{4}$ N.) from Chicago Harbor Light steer 107° (ESE. $\frac{3}{4}$ E.) for $34\frac{1}{2}$ miles, which should bring up to the harbor entrance.

Michigan City to Waukegan.—Steer 314° (NW. $\frac{1}{4}$ W.) for $61\frac{1}{2}$ miles, which should bring up to the harbor entrance.

Grand Haven to Waukegan.—Steer 238° (SW. by W.) for $89\frac{1}{2}$ miles, which should bring up to the harbor entrance.

Grand Haven to Racine.—Steer 253° (WSW. $\frac{3}{4}$ W.) for $75\frac{1}{2}$ miles, which should bring up to the harbor entrance.

Grand Haven to Port Washington.—Steer 285° (WNW. $\frac{1}{4}$ W.) for $81\frac{1}{2}$ miles, which should bring up to the harbor entrance.

Grand Haven to Sheboygan.—Steer 305° (NW. by W.) for $83\frac{1}{2}$ miles, which should bring up to the harbor entrance.

Grand Haven to Manitowoc.—Steer 319° (NW. $\frac{1}{4}$ N.) for $95\frac{1}{2}$ miles, which should bring the breakwater light to bear 270° (W. $\frac{1}{8}$ S.) distant $4\frac{1}{2}$ miles, then steer for the entrance.

Muskegon to Racine.—Steer 245° (SW. by W. $\frac{3}{4}$ W.) for $76\frac{1}{2}$ miles, which should bring up to the harbor entrance.

Muskegon to Sheboygan.—Steer 300° (NW. by W. $\frac{1}{2}$ W.) for $75\frac{1}{2}$ miles which should bring up to the harbor entrance.

Ludington to Manitowoc.—Steer 280° (W. $\frac{3}{4}$ N.) for $54\frac{1}{2}$ miles, which should bring the breakwater light to bear 270° (W. $\frac{1}{8}$ S.) distant $4\frac{1}{2}$ miles then steer for the harbor entrance.

Manistee to Sheboygan.—From a point about 2 miles 297° (NW. by W. $\frac{3}{4}$ W.) from the breakwater light steer 242° (SW. by W. $\frac{3}{4}$ W.) for $73\frac{1}{2}$ miles, which should bring up to the harbor entrance.

Manistee to Manitowoc.—From a point about 2 miles 297° (NW. by W. $\frac{3}{4}$ W.) from the breakwater light steer 259° (WSW. $\frac{1}{4}$ W.) for 60 miles, which should bring breakwater light to bear 270° (W. $\frac{1}{8}$ S.), then steer for the harbor entrance.

Manistee to Porte des Morts Passage.—From a point 297° (NW. by W. $\frac{3}{4}$ W.) from the breakwater light steer 339° (NNW.) for $71\frac{1}{2}$ miles, which should bring up to the light buoy on Outer Shoal, then steer for the entrance.

CHAPTER XIX.

DETOUR PASSAGE—POTAGANNISSING BAY—ST. MARY RIVER AND SAULT STE. MARIE CANALS.

Depths in this chapter are in accord with Lake Huron low water of 1895 (579 feet above mean tide at New York).

Plan.—The plan of this chapter is to describe Detour Passage, Potagannissing Bay, and St. Mary River, and Sault Ste. Marie Canal, beginning with Detour Passage and working upstream to Lake Superior.

St. Mary River.—From Point Detour Lighthouse to the entrance to the canals at Sault Ste. Marie by the ship channel, the distance is 48 miles. For the southern 23 miles the natural channel between the shallow banks is nowhere less than 590 yards wide, and generally much wider.

At $1\frac{1}{2}$ miles southeast of Winter Point, the southern extremity of Neebish (Sailors Encampment) Island, the broad channel ceases, and thence to the canals, channels have been made with a least width of 100 yards and depth of 20 feet at the above datum.

At the above position southeast of Winter Point the hitherto broad channel divides into two, that for upbound vessels, between Neebish (Sailors Encampment) Island and St. Joseph Island taking the name of Little Mud Lake, while its continuation between the north coast of Neebish Island and the southern part of Sugar Island is named Middle Neebish Channel. At the junction of these two stretches there is a passage between the northwestern extremity of St. Joseph and the southeast point of Sugar Island, connecting with the Canadian water of St. Joseph Channel and also with the common water of Lake George.

The passage westward of Neebish (Sailors Encampment) Island, known as West Neebish Channel, is exclusively for down-bound vessels.

In Hay Lake near Nine Mile Point the channels for upbound and down-bound vessels unite, and so continue with a minimum width of 167 yards to the canals, the upbound vessels passing northeastward of those bound down.

The water $4\frac{1}{2}$ miles wide between Drummond and St. Joseph Islands, containing many islands with passages between them, is known as Potagannissing Bay, the greater part of which belongs to the United States.

Regulations—Speed.—Vessels of 500 tons gross or over are not allowed to steam over 10 miles per hour in any of the dredged cuts north of Mud Lake.

Upbound and down bound.—Navigation in the vicinity of Pipe Island shall be by the right-hand channel—upbound vessels passing to the eastward and down-bound vessels passing to the westward of Pipe Island. All vessels upbound to Sault Ste. Marie pass eastward of Neebish (Sailors Encampment) Island; those down bound to Detour Passage, or North Channel of Lake Huron by Potagannissing Bay, pass west of the same. Vessels from the Sault to St. Joseph Channel may use Middle Neebish Channel northeast of Neebish (Sailors Encampment) Island.

Notice of approach.—Upbound vessels, when abreast of Everens Point, St. Joseph Island, must sound a 10 seconds blast on the steam whistle, which shall be answered by any local trading, or other descending vessel between Dark Hole Light Buoy and Johnson Point Lighthouse.

Every local trading, or other down bound vessel, shall when abreast of Dark Hole Light Buoy sound a 10 seconds blast, which shall be answered by a similar blast by any up bound vessel between Everens and Johnson Points. (For complete rules for the navigation of St. Mary River, the master of a vessel should apply to the United States Survey office, Detroit, for the latest "Bulletin for Northern and Northwestern Lakes.")

Buoying and lighting.—As a rule, the light buoys and light beacons (when not ranges) on port hand, up bound, are painted black and show occulting white lights; those on the starboard hand are painted red, and exhibit occulting red lights. The range lights are, with certain exceptions, fixed white.

Navigation season.—St. Mary River is usually free of ice from the last week in April till the first week in December.

For description of Detour Point see chapter IX.

Detour Passage, separating Drummond Island from the mainland of Michigan, is a little over 1,320 yards wide, and $4\frac{1}{2}$ miles long from Detour Reef Light Buoy to Pipe Island lighthouse.

Detour Shoal, with $4\frac{1}{2}$ feet water on it, lies 440 yards northeast of the northeast side of Point Detour.

Buoy.—A black spar buoy marks this shoal.

Radio compass station.—A station is under construction at Detour Point.

Frying Pan Island.—The western shore of the passage from Point Detour to Frying Pan Island is bordered by rocks and shoals extending off 440 yards. The island lies abreast the southern part of the town of Detour, which, in 1900, had a population of about 1,000,

and the island is distant from the shore nearly 440 yards. A patch with 18 feet water over it lies 700 yards south of Frying Pan Island.

Light.—A fixed red light, 19 feet above water, visible 8 miles, is shown from a white conical tower on Frying Pan Island.

Storm signals are exhibited at Detour town from a steel tower on Dawson Street.

Gaffney Point is nearly 2 miles northward from Frying Pan Island, and from the coast between project several wharves; the point is abreast of Pipe Island 880 yards.

Pipe Island is conspicuously situated at the north end of Detour Passage, and from its north side a shallow bank extends in a north-northeast direction over 880 yards, where are situated two islets known as Pipe Island Twins.

Lights.—A fixed red light, 52 feet above water, visible 10 miles, is shown from a white conical tower, on the south side of Pipe Island.

A flashing white light, 26 feet above water, is shown from a black pyramidal tower on the north side of East Pipe Island Twins.

Barbed Point of Drummond Island, is situated nearly $1\frac{1}{2}$ miles east-northeast from the nearest part of Point Detour.

Potagannissing Bay—Dix Point.—From Barbed Point, the western coast of Drummond Island trends northward $3\frac{1}{4}$ miles to a headland called Black Rock Point, close to which the water is deep; thence the coast runs northeastward $1\frac{1}{2}$ miles to Dix (Sims) Point, from which a shallow bank extends westward 590 yards. A string of islands named Little Trout, Bow, Surveyors, and Arrow, lie northeastward of Dix Point, the first named $1\frac{1}{4}$ miles in a north-northeast and the last 1 mile in an easterly direction from Dix Point. Midway between Little Trout and Bow Islands is a shoal with 12 feet on it; from the north point of Little Trout Island, a bank with depth of 13 feet, extends 590 yards in a northeast direction.

Drummond Village is situated $4\frac{1}{2}$ miles eastward from Dix Point, and between them runs in for a distance of 3 miles Sturgeon Bay containing many islets and scattered shallow patches.

Potagannissing River, which empties into the eastern part of Potagannissing Bay, is situated 4 miles in an easterly direction from Drummond Village, the coast between being fronted by a group of some 20 islands, small and large, between which the passages are only suitable for light draft craft. The largest, called Harbor Island, is situated with its south side $1\frac{1}{2}$ miles northward of Drummond Village. It is approximately $1\frac{1}{2}$ miles square, 100 feet high, and contains a boat harbor with narrow entrance on its south side.

Burnt Island.—A group of eleven islands belonging to the United States lie in the middle of the entrance to Potagannissing Bay from North Channel. The largest, named Burnt Island, is 1.3 miles

long east and west, and just separated from Wilson Island, the next largest, east of it. The group stands upon a bank on which there is very little water.

Norris and Spence Islands are near the edge of the bank extending westward from Burnt Island. Claw and Harris Islands lie on the southern side of Burnt Island. Twin Sister Island lies about 1,320 yards south of the southeastern extremity of Wilson Island. Cherry Island lies over 440 yards northeastward of Cedar Island.

Long Island, over 440 yards long north and south, lies a little over 1 mile southward of the southern extremity of Burnt Island.

Propellor Island, quite small, lies over 1,320 yards southeast from Cedar Island, the southeastern of the Burnt Island Group.

Submerged net stakes, with 12 feet over their upper ends, lie west of Propellor and south of Cedar Island, and a shoal with 9 feet water on it lies over 590 yards northward of Propellor Island. A bank with 8 feet on it extends over 880 yards westward from the latter, and a rock with 2 feet lies over 590 yards eastward from the same island.

North Seine Island is the northern of the Burnt Island group, being joined to South Seine Island by a very narrow isthmus. Shallow water extends northward from the north point of North Seine Island 150 yards, its east and west sides being steep to; both these islands together with Maple Island southeast of them, belong to Canada.

Maple Island, 880 yards long north and south, lies with its western extremity 880 yards east of the southern extremity of South Seine Island.

Old Fort St. Joe Point, the southern extremity of St. Joseph Island, is situated 4 miles southwest by west from Burnt Point, the coast between being indented by several small bays and fronted at a distance of 1,320 yards by four islands connected to the coast by shallow water; these four islands belong to Canada.

Macomb Island, over 1,320 yards long, is the largest of a group of six islands, consisting of Cass, Big Trout, Andyway, Little Cass, Maple, and Butterfield Islands, separated from Burnt Island group by a channel with depth of 4 to 6 fathoms.

Big Trout Island, lying $4\frac{1}{4}$ miles eastward from Old Fort St. Joe Point and $1\frac{1}{4}$ miles north of Dix Point. The island belongs to the United States.

Bacon Island, small and narrow, lies nearly 1 mile eastward from Big Trout Island.

Bacon Shoal, with $1\frac{1}{2}$ feet water over it, 440 yards northwest from the northeastern extremity of Bacon Island; and a patch with 12 feet on it lies the same distance east-northeast from the south point of Big Trout Island.

Long Island, 590 yards long northeast by north, lies in that direction $1\frac{1}{4}$ miles from Bacon Island. Southward of the line joining Long and Cedar Islands, are numerous submerged fishing net stakes, the tops of which, a few feet below the surface, are dangerous to navigation.

Burnt Point is situated $3\frac{3}{4}$ miles southwest from Koshkawong Point, and between them extends northwestward Worsely Bay, the bottom and narrower portion of which is called Tenby Bay.

Two rocks with 3 and 9 feet water on them, lie east and northeast respectively from Whitman Point, the southwest entrance point of Tenby Bay, and $1\frac{1}{2}$ miles from the bottom.

Immediately northward of the Burnt Point promontory is an indentation called Sterling Bay, at the bottom of which is erected a small sawmill and wharf, both in poor condition in 1914.

Rock.—A rock with 7 feet on it lies nearly 1 mile east by south from Burnt Point and over 590 yards northward of Butterfield Island.

Salt Island, also belonging to the latter, is small and has good water about it; it lies 1 mile westward from the north point of North Seine Island and 1,320 yards east-southeastward of Koshkawong Point of St. Joseph Island.

Koshkawong Point is the southwest entrance point of Milford Haven, which, together with the group of islands extending to Perrique Island $2\frac{1}{2}$ miles eastward of it.

Directions.—The track from Detour Passage to North Channel of Lake Huron laid down on the chart is as follows: From Frying Pan Island steer with the southern extremity of Bacon Island in range with the northwest side of Little Trout Island, bearing 34° (NE. $\frac{1}{2}$ N.), until northwest of Dix Point; then 86° (E.) for the south point of Gull Island (the southwestern of the Harbor Island group) seen between Surveyors and Bow Islands, until equidistant from Gull and Surveyors Islands.

Now haul northward and steer 8° (N. by E.) for $2\frac{1}{4}$ miles until the southern extremity of Big Trout Island is in range with the north point of Bacon Island, bearing 248° (WSW. $\frac{3}{4}$ W.), and Propellor Island ahead. Keep the first two islands in range astern for 2 miles, until 1,320 yards from the latter, when haul northward and steer 29° (NE. by N.) passing between the submerged net stakes on the northwest, and the dangerous bank from Propellor Island on the southeast side.

Pipe Island (Hoyt) Shoal, consisting of two rocky patches with 11 and 12 feet over them, lie over 880 yards southeast of the lighthouse.

Light buoy.—A black conical buoy showing an occulting white light, is moored in 20 feet on the southeast side of Pipe Island Shoal.

Watson Reefs are five small detached patches lying between Sims wharf and Gaffney Point; the shoalest has but 2 feet of water on it, with deeper water between it and Watson Coal Wharf.

Light buoy.—A black conical buoy showing an occulting white light is moored in 30 feet on the west side of the vessel's track abreast the center of the reefs.

Sweets Point.—From Gaffney Point, the main shore trends northwestward nearly 2 miles to Sweets Point, close off which are two small islets known as Sweets Islands.

Sweets Point Shoal.—From this point, a bank extends nearly 880 yards northward.

Light buoy.—A black conical buoy, showing an occulting white light, is moored in 20 feet off the northern end of Sweets Point shoal.

Squaw Island, small, lies northward a little more than $1\frac{1}{2}$ miles from Pipe Island.

Light.—A flashing red light, 26 feet above water, is shown from a red, pyramidal steel tower on the southern point of Squaw Island.

Pointe aux Frenes.—From Sweets Point, the shore trends west southwest 2 miles, and then northwest by north nearly straight. 7 miles to Raber Village and wharves, whence it runs northeastward 3.3 miles to a prominent projection 20 feet high, known as Pointe aux Frenes; the last stretch having a shallow bank extending 1 mile from it.

Light buoy.—A black conical buoy, showing an occulting white light, is moored in 24 feet, nearly 880 yards northeastward of Pointe aux Frenes.

Hay Point, of St. Joseph Island, is situated 5.3 miles northwestward of Old Fort St. Joe Point, the shore between being low and marshy; shoal water under the name of Hay Point Reef, extends 880 yards northwest from Hay Point.

Lime Island, with several small islands lying northeast of it, is United States territory. Lime Island is 2.6 miles long and lies abreast the stretch of coast last mentioned, being joined thereto by shallow water. On its northwest end stands the conspicuous coal hoist and wharf of the Pittsburgh Coal Co.

Round Island.—The small island under this name lies midway between Lime Island and Pointe aux Frenes, and bank terminating in a depth of 6 feet extends 1 mile in a south-southwest direction from the island.

Light.—A fixed white light with a red sector, 40 feet above water, is shown from a buff square tower attached to a dwelling on the eastern side of Round Island.

Buoys.—A black spar buoy marking a patch of 13 feet lies 1,175 yards south, and a red spar buoy marking a patch of 6 feet lies 880 yards eastward of Round Island Light.

Rocky Point.—From Point aux Frenes the Michigan shore trends northwestward $5\frac{1}{2}$ miles to Rocky Point, the shore bank under the depth of 18 feet extending from the bottom of the bight 1.3 miles. North $1\frac{1}{4}$ miles from Rocky Point the hitherto common broad channel for both upbound and down-bound vessels divides; that for upbound passing eastward, and that for down-bound vessels westward of Neebish (Sailors Encampment) Island.

Richardson Point.—From Hay Point the coast of St. Joseph Island turns abruptly eastward for $1\frac{1}{4}$ miles, and then runs northwestward 6.3 miles to Richardson Point, being fronted by a shallow bank 1,175 yards wide.

Pilot Island range lights—Front light.—An occulting white light, 39 feet above the water, is shown from a white pyramidal tower located on Pilot Island.

Rear light.—A fixed white light, 58 feet above the water, is shown from a white pyramidal tower located 628 yards 196° (S. by W. $\frac{1}{2}$ W.) from the front light.

These in range astern lead upbound vessels from Mud Lake to the line of Rains Wharf Range.

Mud Lake Crib Light Buoy.—A black conical buoy, showing an occulting white light, is moored in 21 feet at the bifurcation of the up and down bound channels.

Kemps Point.—From Rocky Point the Michigan shore trends in a general west direction 6 miles, being broken up into several shallow bays; then the shore runs northwestward 2 miles, and then east-northeast 5 miles to Kemps Point, forming a large shallow indentation known as Munuscong Bay. One mile northward of Kemps Point is the box sawmill of the Chicago Mill Lumber Co.

Neebish (Sailors Encampment) Island is nearly 8 miles long, and half that distance in greatest breadth. The dredged channel between it and the Michigan shore, in some places only 300 feet wide, is known as West Neebish; that with the same width in parts between Neebish and St. Joseph Island being known as Little Mud Lake.

Winter Point is the most southerly extremity of Neebish (Sailors Encampment) Island, and is surrounded by a shallow flat through which a channel 300 feet wide is dredged for down-bound vessels.

Winter Point range lights—Front light.—A fixed white light, 22 feet above water, is shown from a white square skeleton tower on the southern end of Neebish Island.

Rear light.—A fixed white light, 68 feet above water, visible 68 miles, is shown from a black triangular skeleton tower with a white daymark 258 yards 310° (NW. $\frac{1}{4}$ W.) from the front light.

These in range lead upbound vessels through Mud Lake to the line of Sailors Encampment range lights.

Rains Island, about 40 feet high and over 1 mile in length, is just separated from the east side of Neebish Island; and its eastern extremity is known as Johnson Point, distant in a northeast direction $3\frac{1}{4}$ miles from Winter Point, the shore bank gradually narrowing toward the former, which is steep-to.

Light.—An occulting white light, 24 feet above water, is shown from a black post and tanks on pier in 10 feet at the turn into Dark Hole Passage off Johnson Point.

Depth signals.—When the depth in the channel is below normal, a red ball by day and a red light by night are hoisted on a mast on Johnson Point.

Sailors Encampment range lights—Front light.—A fixed white light, 35 feet above water, visible 6 miles, is shown from a white square tower on Rains Hill, St. Joseph Island.

Rear light.—A fixed white light, 83 feet above water, visible 6 miles, is shown from a white square tower 269 yards 16° (N. by E. $\frac{1}{2}$ E.) from the front light.

These in conjunction with the Pilot Island range lead upbound vessels from Mud Lake to Johnson Point.

Rains Wharf range lights—Front light.—A fixed red light, 21 feet above water, visible 2 miles, is shown from a mast north of the wharf on St. Josephs Island.

Rear light.—A fixed red light, 22 feet above water, visible 2 miles, is shown from a mast 145 yards 133° (SE. $\frac{1}{2}$ S.) from the front light.

These in conjunction with the Point of Woods range lead 313° (NW. $\frac{1}{2}$ N.) from the line of Sailors Encampment to that of Harwood Point Range.

Point of Woods range lights—Front light.—A fixed red light, 14 feet above water, is shown from a white post with a diamond-shaped daymark on the east side of Neebish Island.

Rear light.—A fixed red light, 44 feet above water, is shown from a white post with a diamond-shaped daymark 101 yards 313° (NW. $\frac{1}{2}$ N.) from the front light.

These are used in conjunction with the Rains Wharf range.

Dark Hole range lights—Front light.—A fixed white light, 17 feet above water, is shown from a white post on the north point of Rains Island.

Rear light.—A fixed white light, 45 feet above water, is shown from a white post 171 yards 176° (S. $\frac{1}{2}$ E.) from the front light.

These in range astern are used in conjunction with Harwood Point range ahead, lead through Little Mud Lake.

Hen and Chickens range lights—Front light.—A fixed red light, 22 feet above water, is shown from a white post on the east shore of Neebish Island.

Rear light.—A fixed red light, 32 feet above water, is shown from a white post 566 yards 231° (SW. $\frac{1}{4}$ W.) from the front light.

These in range lead between Sugar and St. Joseph Island.

Everens Point.—From Richardson Point of St. Joseph Island the coast trends north-northwest $3\frac{1}{2}$ miles to Everens Point and is fronted by a shallow bank which, midway, stretches off $1\frac{1}{2}$ miles.

Coyle Point.—From Everens Point the coast of St. Joseph Island turns north-northeast for $1\frac{1}{2}$ miles to Rains Wharf, the range near which has been described. Thence the coast of St. Joseph Island, with several small wharves projecting from it, runs northwest nearly $1\frac{1}{2}$ miles to Coyle Point.

Stribling Point.—From Coyle Point the coast of St. Joseph Island runs north nearly 3 miles to Stribling Point, which, with its range lights, are described later.

Harwood range lights—Front light.—A fixed white light, 22 feet above water, is shown from a white post on the southeast end of Sugar Islands.

Rear light.—A fixed white light, 35 feet above water, is shown from a white post 241 yards 356° (N. $\frac{1}{4}$ W.) from the front light.

These in conjunction with Dark Hole range lead through the channel.

Channel.—The channel between St. Joseph and Neebish Islands below Rain Island has a minimum width of about 354 yards between the 18 foot curves. The eastern side of this part of the channel is marked by red buoys; the western is unmarked.

Abreast the southern end of Rain Island the channel narrows to about 100 yards until abreast Johnson Point, where it widens to about 300 yards until above Mirre and Coyle Points. The easterly side of this section of the channel is marked by red buoys and the western by black.

From above Mirre and Coyle Points the channel is about 100 yards wide and marked on the eastern side by red buoys and the western by black.

Rain Island Lightbuoy.—A black cylindrical buoy, showing a flashing white light, is moored in 20 feet on the west side of the channel abreast the southern end of Rain Island.

Encampment Crib Light, occulting red, 26 feet above water, is shown from a red, square, pyramidal, skeleton tower off the south end of Sailors Encampment.

Dark Hole Lightbuoy.—A red cylindrical buoy, showing a flashing red light, is moored in 24 feet on the eastern side of the channel opposite Mirre Point.

Stribling Point Lightbuoy.—A black cylindrical buoy, showing a flashing white light, is moored in 22 feet on the western side of the chanel opposite Stribling Point.

Middle Neebish Channel is the dredged cut $3\frac{1}{4}$ miles long between Neebish (Sailors Encampment) Island and Sugar Island, and is for up-bound vessels between Detour Passage and Sault Ste. Marie, but vessels down-bound to the Canadian water of St. Joseph Channel also use it.

Lightbuoy.—A black cylindrical buoy, showing a flashing white light, is moored in 22 feet at the southeastern entrance point to Middle Neebish Channel.

Middle Neebish Cut lights—No. 1.—A fixed white light, 20 feet above water, is shown from a white post and house on a crib on the southerly edge of the channel.

No. 2.—A fixed red light, 20 feet above water, is shown from a red post and house on a platform on the east end of the dike.

No. 3.—A fixed white light, 20 feet above water, visible 20 miles, is shown from a white post and house on a crib on the southerly edge of the channel.

No. 4.—A fixed red light, 20 feet above water, is shown from a red post and house on a platform on the northern edge of the channel at the center of the dike.

No. 5.—A fixed white light, 20 feet above water, is shown from a white post and house on a crib on the southerly edge of the channel.

No. 6.—A fixed red light, 20 feet above water, is shown from a red post and house on a platform on the northern side, at the upper end of the dike.

Range lights—Stribling Point range—Front light.—A fixed white light, 30 feet above water, visible 5 miles, is shown from a white, square, wooden structure on the northwest end of St. Joseph Island.

Rear light.—A fixed white light, 53 feet above water, visible 5 miles, is shown from a white, square, wooden structure 482 yards 112° (SE. by E. $\frac{3}{4}$ E.) from the front light.

These in range lead through Middle Neebish Channel.

Middle Neebish range—Front light.—A fixed white light, 17 feet above water, is shown from a white post on a crib at the north-western end of the cut.

Rear light.—A fixed white light, 34 feet above water, is shown from a white post on a crib, in 14 feet, 830 yards 292° (NW. by W. $\frac{1}{2}$ W.) from the front light.

These in range, in conjunction with the Stribling Point range, lead through Middle Neebish Channel.

Buoys.—In addition to the lights and light buoys, the cut is marked on the northern side by red buoys and on the southern by black.

Hay Lake.—From the southeast light of the Middle Neebish range, the up-bound track leads through the southern part of Hay Lake, the first 3 miles being through a dredged cut the edges of which are marked with various pairs of lighted and unlighted buoys. Thence, the same course continues another $2\frac{1}{4}$ miles to a little north of Nine Mile Point of Sugar Island, when it joins the common channel to the Sault.

Lower Hay Lake cut extends northwesterly from Middle Neebish front range light to deep water in Hay Lake on the western side of Sugar Island.

Lights—Junction No. 8.—A fixed red light, 20 feet above water, is shown from a red post and house on a crib on the north edge of the channel at the turn.

West Middle, No. 13.—An occulting white light, 32 feet above water, is shown from a black column adjoining a lamphouse on a concrete pier in 21 feet on the western side of the channel.

Lightbuoys.—East Middle, No. 4.—A red conical buoy, showing an occulting red light, is moored in 20 feet on the east side of the channel.

East Side Entrance, No. 10.—A red conical buoy, showing an occulting red light, is moored in 20 feet on the east side of the channel.

West Side Entrance, No. 11.—A black conical buoy, showing an occulting white light, is moored in 20 feet on the west side of the channel.

Lower Hay Lake range lights—Front light.—A fixed white light, 44 feet above the water, is shown from a black, square, pyramidal tower located on the north end of Neebish Island.

Rear light.—A fixed white light, 94 feet above water, is shown from a black square pyramidal tower located 572 yards $150^{\circ} 18'$ (SSE. $\frac{1}{4}$ E.) from the front light.

These in range lead through Lower Hay Lake cut.

Buoys.—Lower Hay Lake cut is also marked by red buoys on the eastern side and black on the western.

West Neebish.—A mile northward of the conspicuous Chicago Co.'s saw mill, is the lower end of the high pile of gravel and rock dredged from the cut 300 feet broad, which extends $1\frac{1}{2}$ miles northward, giving the name of West Neebish to this down bound channel.

The whole of this channel, $13\frac{3}{4}$ miles long from Winter Point to Nine Mile Point, has a controlling depth of $20\frac{1}{2}$ feet. At Hay Lake it merges with the upbound channel into a common track.

Navigation aids—West Side lower light buoy, No. 1.—A black cylindrical buoy, showing an occulting white light, is moored in 22 feet on the southerly side of the lower entrance.

East Side Lower Lightbuoy, No. 2.—A red, cylindrical buoy, showing a flashing red light, is moored in 22 feet on the northerly side of the lower entrance.

East Side Upper Light, No. 24, fixed red, 32 feet above water. is shown from a red column in 20 feet on the east side of the upper entrance.

West Side Upper Light, No. 25, fixed white, 32 feet above water, is shown from a black column in 20 feet on the western side of the upper entrance.

This entire channel is marked by numerous pairs of beacon lights, with additional beacon lights or light buoys at the changes of course, and by red buoys on the eastern side and black on the western; for a more complete description of same mariners should consult the chart and light list.

Nine Mile Point is on the western side of Hay Lake. A shoal bank with about 12 feet on its outer edge extends about 350 yards off the point.

Light.—A flashing white light, 32 feet above water, visible 8 miles, is shown from a red column in 12 feet on the edge of the bank extending from Nine Mile Point.

Middle Hay Lake range—Front light.—A fixed white light, 31 feet above water, is shown from a black skeleton tower on the dumping ground northeastward of Six Mile Point.

Bear light.—A fixed white light, 80 feet above water, is shown from a black, square, pyramidal tower 1,066 yards 340° (N. by W. $\frac{1}{2}$ W.) from the front light.

Daymarks.—A white daymark is mounted on each of these light towers. These daymarks or lights in range lead through Hay Lake on the common range from Nine Mile Point to their intersection with the Frechette Point range.

Six Mile Point is on the western side of Hay Lake at the lower end of the channel leading to Sault Ste. Marie.

Range lights—Front light.—A fixed white light, 28 feet above water, is shown from a white cylindrical tower in 8 feet of water about 880 yards above the point.

Bear light.—A fixed white light, 47 feet above water, is shown from a white cylindrical tower 658 yards 153° (SSE.) from the front light.

These in range lead from the line of the Frechette Point range to that of the Bayfield Rock range.

Frechette Point is on the western side of Hay Lake near the middle of the dredged channel.

Range lights—Front light.—A fixed red light, 40 feet above water, is shown from a black, square, pyramidal tower in 3 feet of water below Frechette Point.

Rear light.—A fixed red light, 80 feet above water, is shown from a black, square, pyramidal tower 916 yards 323° (NNW. $\frac{1}{4}$ W.) from the front light.

Daymarks.—White horizontally striped daymarks are mounted on these towers.

These daymarks or lights in range lead from the Middle Hay Lake range to the Six Mile range.

Channel.—This channel from Six Mile Point to the waters of the Sault Ste. Marie has a controlling depth of 20 $\frac{1}{2}$ feet. The upper part is cut through some islands and is known as Little Rapids Cut.

Lights—Little Rapids Cut.—An occulting white light, 18 feet above water, is shown from a black mast on Island No. 1 on the western side of the cut.

An occulting red light, 20 feet above water, is shown from a red mast located on the eastern side of the cut on Island No. 1.

An occulting red light, 18 feet above water, is shown from a red mast on the eastern side of the cut off the northern end of Island No. 1.

An occulting white light, 18 feet above water, is shown from a black mast on Mission Point on the western side of the north entrance to the cut.

North Entrance Light, No. 27, occulting white, 35 feet above water, is shown from a black, skeleton tower on the west side of the north entrance to Little Rapids Cut.

A black spar buoy is moored just northward of the light.

Buoys.—In addition to the lights, Hay Lake Upper Channel is marked on its western side by black buoys and its eastern by red.

Sault Ste. Marie, Mich., lies on the south side of the St. Marys River at the St. Marys Rapids, and extends from Hay Lake Upper Cut westward for about 5 miles. The river is here the boundary between the United States and Canada.

The population is 12,096 (1920).

Buoys.—A black spar buoy is moored on the edge of the shoal at Chesbrough Dock.

Shoals.—Across the St. Marys River, northward of Mission Point, shoals extend about 800 yards off shore.

Buoys.—Three red spar buoys mark the edge of these shoals.

Harbor.—The harbor front extends about 1 $\frac{1}{2}$ miles above and below the United States canal properties. The available depth in front of the city wharves is about 21 feet.

St. Marys Falls, Mich.—The rapids of the St. Marys River, located about 14 miles below the head of the river at Point Iroquois.

are about 1,320 yards long and 880 yards wide, and the fall ranges from 17 to 21 feet with the varying stages of water.

Canals.—The distance between the eastern and western ends of the United States canals is about 1.6 miles. The canals are faced with revetment walls and piers of timber and concrete. The width of the westerly entrance, where the two canals are in one, is 854 feet between the north and south piers, continuing for a distance of about 1,200 feet, or to the west end of the center pier which separates the south canal leading to the Weitzel and Poe Locks from the north canal leading to the Third and Fourth Locks. The total width of the easterly entrance between the Fort Brady and northeast piers is 1,260 feet.

South Canal, Poe and Weitzel Locks.—The width of the south canal between the southwest pier and west center pier is variable, being about 400 feet at the upper entrance, two passages of 108 feet each on either side of Bridge Island, 270 feet at the basin above the Weitzel and Poe Locks, and 660 feet at the lower entrance between the Fort Brady and east center piers. The depth of water in the upper level is $24\frac{1}{2}$ feet and in the lower level $19\frac{1}{2}$ feet up to the entrance to the Poe Lock. Near the east or lower end of this canal are two masonry locks, parallel and abreast of each other, and with axes 230 feet apart, known, respectively, as the Weitzel Lock and the Poe Lock.

The Weitzel Lock is 515 feet long in chamber, 80 feet wide, narrowing to 60 feet at the gates, with low-water depth of about 13 feet; it is operated by hydraulic power.

The Poe Lock is 800 feet long in chamber, 100 feet wide, with a depth of 18 feet at low water. During last season the average depth was 19.1 feet. This lock is operated by hydraulic power.

Bridge Island is located in the south canal at the crossing of the international bridge. Upon this island rest the center piers of the movable dam and of the railroad drawbridge. Upbound vessels passing Bridge Island will take the south passage and downbound vessels the north passage unless instructed to the contrary by the canal superintendent.

North Canal—Third and Fourth Locks.—The width of the north canal between the northwest pier and west center pier is 300 feet at the west end, 282 feet at the bascule bridge, 310 feet in the basin above the locks, and 520 feet in the lower entrance at the outer ends of the east center pier and northeast pier. The least depth of water in this canal, including the locks is $24\frac{1}{2}$ feet.

The Third Lock, which is parallel to and 240 feet north of the Poe Lock, is 1,350 feet long between gates, giving a usable length of not less than 1,300 feet, 80 feet wide, and has a least depth of $24\frac{1}{2}$ feet. Electric power is used for operating this lock.

The Fourth Lock parallels the Third Lock on its north side, has the same dimensions, and is connected with the same canal.

Draft of vessels—Directions for locking.—The depth in the north canal and Third and Fourth Locks is greater than that in the open improved channels of St. Marys River, now about 21 feet at low water. Vessels drawing 20 feet can ordinarily navigate any of these improved channels.

Masters of vessels approaching the locks will report the name of vessel and its draft to the lookout station at Little Rapids cut or at Brush Point when passing. Upon arriving at the canal they will report to the lockman at the end of the entrance pier and receive instructions regarding the channel to be taken.

In order that vessels may know before coming within calling distance of the west center pier whether there is sufficient water for them to take the Poe Lock, the draft in the Poe Lock is displayed at the watch station at the end of this center pier, the display box being properly lighted so that the draft may be read at night.

To facilitate the passage of commerce it is desirable to use the Poe Lock to the fullest extent for such boats as are able to pass that lock. Accordingly, downbound boats having suitable draft will usually be sent to the Poe Lock. When the Third Lock is congested with downbound boats not able to pass the Poe Lock, all upbound boats of suitable draft will be sent to the Poe Lock in order to facilitate the downbound movement of heavily loaded boats having such draft that they must pass the Third Lock.

Traffic.—In 1920, 18,848 vessels, with a total net tonnage of 58,196,498 tons, passed through the United States and Canadian canals.

Signal to designate lock for upbound vessels.—To indicate to upbound vessels the lock they are to take there is installed on top of the watchman's shelter near the end of the east center pier a signal composed of a semaphore arm supplied with nine white lights at night. If the arm points toward the south and upward at an angle of 45°, it indicates that the vessel signaled is to take the Poe Lock. If it points toward the north and upward at an angle of 45° the Third Lock is to be taken, and if it points north horizontally the Fourth Lock is to be taken.

Current toward Michigan Northern Power Canal.—A current, which apparently does not exceed 1 mile per hour, sets toward the Michigan Northern Power Co. Canal, immediately on the south of the west or upper entrance of the ship canals. Downbound vessels should hold the Vidal Shoals range until the bow is opposite the end of the southwest pier when taking the south canal for the Poe Lock. Vessels bound for the Third or the Fourth Lock, on approach-

ing the canal will leave the Vidal Shoals range to the southward so as to land at the northwest pier.

Landing at West Center Pier.—The filling of the locks causes a current to set across the end of the west center pier, this current sometimes being in one direction and sometimes in the other. Vessels bound for the Poe Lock should not attempt to make the pier near the end. Vessels are not permitted to land on the north side of this pier west of the bridge.

Landing at East Center Pier.—An eddy makes upstream along the Fort Brady Pier and sets to the north across the end of the east center pier to join the main current of the river. Masters of vessels bound through the Poe Lock should not try to bring the bow of vessel to the east center pier near the end but should keep to the south until the bow is well inside the pier; the boat will then come in easily on a port wheel.

Bayfield Rock Range lights—Front light.—A fixed white light, 24 feet above water, is shown from a white octagonal pyramidal tower on the northwest end of Sugar Island.

Rear light.—A fixed white light, 34 feet above water, is shown from a white octagonal pyramidal tower 315 yards $109^{\circ} 03'$ (ESE.) from the front light.

These in range lead from the upper Hay Lake cut range to St. Marys Falls.

Canal lock lights.—Northeast Pierhead Light, fixed red, is on the southeast corner of the pierhead east entrance to the north canal.

East Center Pier range light—Front light.—A fixed red light, 20 feet above water, is shown from a red post located on the pierhead at the eastern entrance to the canals.

Rear light.—A fixed red light, 30 feet above water, is shown from a pole 35 yards 273° (W. $\frac{1}{2}$ N.) from the front light.

A fixed white light is shown from the same pole as the red light, 5 feet below it.

These lights in range mark the direction of the pier.

West Center Pierhead light, occulting white, 41 feet above water, is shown from a black conical tower on the pierhead at the west entrance to the canals.

Southwest Pier light, fixed red, is shown from a pole on pierhead at the west entrance to the canals.

Northwest Pierhead light, fixed red, is shown from a pole on pierhead at the west entrance to the canals.

Bridge.—Above the locks the International railroad bridge crosses the canals at a point about 400 yards east of the west end of the center pier and about 100 yards west of the movable dam. Across the south canal there is a swing draw span, electrically operated,

having a clear opening on either side of Bridge Island of 114 feet 5 inches, but as the line of crossing is somewhat oblique, the available width between canal walls is only 108 feet; the clear height of the draw span above low water is 15 feet. Across the north canal there is a double-leaf bascule, electrically operated, with clear opening between canal walls of 94 yards and clear height above low-water surface of about 15 feet. The bridge is continued across the river at the head of the rapids by nine fixed spans, each of approximately 77 yards clear width and 15 feet clear height above the water surface.

Bridge lights.—The swing bridge has a red light on upstream and downstream end of each abutment; a red light on each side of center pier; a red light on west end of center-pier protection; three lights on center line of top of swing span, one at east end and one in middle, showing red to boats when bridge is closed and green when open. The bascule bridge has a red light on upstream and downstream end of each abutment; a light on upstream and downstream side of outer end of each leaf, swinging with leaf and showing red when bridge is closed and green when open.

Both draws ordinarily remain open; their operation is governed by one horn installed on the bascule. An approaching locomotive sounds one blast; the bridge returns one blast and, if practicable, closes and sounds six blasts; locomotive answers with two blasts before proceeding to cross. An approaching vessel sounds three blasts as a signal for opening the bridge, if it is closed; if it can not be opened immediately, the bridge returns three blasts for the boat to check, and should a boat come too close the bridge may give several short blasts as a danger signal. When the bridge is down, vessels should approach it only under full control, as it may be impossible to open it at once on signal.

Signals.—In order that masters of down-bound vessels landing at the northwest pier may know when the Third or the Fourth Lock is filling, target signals have been erected, one on the southern side of each lock near the western end. Each target is a circular disk, 6 feet in diameter, mounted on a 35-foot pole. A pale yellow light is mounted on a staff 17 feet above the center of the target. The signals are shown as follows:

Lock not filling.—Day signal: Face of target shows a black band 9 inches wide at the circumference, white center 4 feet 6 inches in diameter.

Night signal: A fixed yellow light.

Lock filling.—Day signal: Face of target shows a black band 9 inches wide at the circumference, a black center 2 feet 3 inches in diameter, and a white band intermediate between the black outside band and black center.

General information.—Masters or clerks using the canals are required to report as specified in paragraph 13 of the Rules and Regulations. Vessel record blanks for these reports and copies of the Rules and Regulations can be obtained on application at the United States Canal Office, located in the pump house and office building between the Poe and Third Locks.

A marine post office, designated Canal Station, is maintained by the Post Office Department in the same building.

Storm warnings.—Day and night signals are displayed from a steel tower 25 feet northwest of Weather Bureau building in Canal Park, Portage Avenue West.

Sault Ste. Marie, Ontario, had in 1911 a population of 10,984, and, like Sault Ste. Marie, Mich., on the opposite side, has by means of the power from the falls many manufacturing industries. Sault Ste. Marie, Mich., has a population of 12,096 (1920).

Customs.—It is a port of entry, to which all the customs out-ports in North Channel of Lake Huron as far east as Killarney are subject.

Radio stations.—The Canadian establishment is situated on the high land eastward of the town; it has a working radius of 350 miles and the call is VBB.

Storm signals are displayed from a mast on the Canadian Government wharf.

Range lights—Front light.—A fixed red light, 63 feet above water, visible 2 miles, is shown from a gray square pyramidal tower on the shore of the bay north of the entrance.

Rear light.—A fixed red light, 90 feet above the water, visible 2 miles, is shown from a gray square pyramidal tower 452 yards, 321° $30'$ (NW. $\frac{1}{2}$ N.) from the front light.

A white day mark is mounted on each light tower.

These lights or day marks in range lead upstream to the Canadian locks.

Light buoy.—A black cylindrical buoy, showing an occulting white light, is moored at the lower entrance to the Canadian Canal.

Buoys.—Two red spar buoys mark the eastern side near the lower entrance.

Wharf.—The Canadian Government wharf is situated one mile southeastward of the Canadian canal entrance. It is 655 feet long, with an ell end 350 feet broad, and has a depth of 19 feet at the datum of this chapter.

There is an electric light on the wharf.

Buoy.—A red spar buoy moored in 21 feet east of the wharf.

Canadian canal.—The length of the one lock of this canal is 900 feet, breadth 60 feet, and depth on sill 19 feet.

Railway bridge signals.—The Canadian Pacific Railroad crosses the Canadian canals at about 590 yards above the locks of the former, and the “draws” are usually open. Should they be closed, the signal for opening the “draw” of the Canadian bridge is three long blasts followed by two short ones. The bridges, if closed at night, show a red light.

Directions.—The courses and distances in statute miles, being laid down on the Lake Survey Charts Nos. 61, 62, 63 of the river already quoted, it is unnecessary to repeat them here. The given courses on these charts are true, and for the compass courses the westerly variation has to be applied. This ranges from 5 degrees at point Detour to $3\frac{1}{2}$ degrees at Sault Ste. Marie.

Currents in St. Marys River.—As the speeds referred to in the foregoing rules apply to the speeds over the bottom, and as the currents in the river are variable, masters are cautioned to regulate the speed of their vessels by running on time from point to point instead of relying on the number of revolutions per minute of the propeller (see Schedule of Distances and Times below).

The swiftest currents in the navigable channels of the St. Marys River are found at the Middle Neebish dike, the West Neebish rock cut, and the Little Rapids cut. The strength of the current depends largely upon the discharge of the river and the elevation of the water surface at the mouth of the river. The discharge of the river is now under control and is varied according to water-level requirements. When the water surface at the upper end of Lake Huron is high, because of easterly or southerly winds or because of barometric variations, the current velocity is temporarily checked. When the stage of Lake Superior is such that a large flow is being permitted, the current is strong and is further increased if the level of Lake Huron is low.

The following limits of velocity may be expected in the several reaches of the channel:

Velocity in miles per hour.

	Usual.	Probable low.	Probable high.
West Neebish Rock Cut.....	2	$1\frac{1}{2}$	$3\frac{1}{2}$
Middle Neebish Dike and Little Rapids Cut.....	$1\frac{1}{2}$	1	3

Pittsburgh Coal Dock.—The Pittsburgh Coal Co. has dredged a channel 19 feet deep and about 50 feet wide, leading from the Vidal Shoals Channel to the company's dock, formerly known as the Port Royal Dock.

Vidal Shoals.—These shoals are located in the approach to the American and Canadian Canals at Sault Ste. Marie, and two channels leading to the respective canals have been dredged through the shoals.

The American channel has a depth of 22 feet for a width of 333 yards; the Canadian channel has a depth of about 21 feet and is 167 yards wide.

Upper Entrance range lights—Front light.—A fixed red light 34 feet above water, visible 2 miles, is shown from a gray square, skeleton tower on a pier 135 yards east of Commercial dock.

Rear light.—A fixed red light, 65 feet above water, visible 2 miles, is shown from a gray square skeleton tower, on the east end of Davignon Point 421 yards 51° (NE. $\frac{1}{4}$ E.) from the front light.

A white box is mounted on and a white conical daymark in each tower.

These lights or daymarks in range lead through the Canadian Channel northward of Vidal Shoals up to the entrance to the Canadian Canal.

Light buoys.—A black cylindrical buoy, showing an occulting white light, is moored on the south edge of the dredged turn west of the upper end of the south entrance pier Canadian Canal.

Buoys.—Three red spar buoys mark the northern side of the upper entrance to the Canadian Canal.

Vidal Shoals Channel range lights—Front light.—An occulting red light, 62 feet above water, is shown from a black skeleton tower on the north pier west of the International Bridge.

Rear light.—A fixed red light, 98 feet above water, is shown from a black skeleton tower 700 yards 75° (ENE. $\frac{1}{4}$ E.) from the front light.

A white daymark is attached to each of the light towers.

These daymarks or lights in range lead through the American Channel southward of Vidal Shoals to the entrance to the American Canal.

Navigational aids.—Both the American and Canadian channels through the Vidal Shoals are adequately marked by light and other buoys; for a complete and comprehensive description of them the mariner is referred to the chart and light list.

A dispatch station of the Lakes Carriers' Association is located north of the Sault Ste. Marie waterworks pump house and above Vidal Shoals, for the purpose of directing downbound vessels to the lock where the least delay to their passage will be incurred. The station is kept informed by telephone of the changing conditions at the locks. This service facilitates the movement of vessels through the canals.

At Pointe aux Pins, abreast of the fixed white light, the width of naturally deep water is about 267 yards, this being the point of least width in the upper river channel. Turning from the Brush Point range here, the short reach thence to where the fixed white lights of the Pointe aux Pins range come on widens to about 400 yards at the lower end. There is a wide passage of deep water on the Pointe aux Pins range and turning on the Vidal Shoals Channel range opposite Big Point. At the latter point, is the submerged water intake crib about 567 yards offshore.

Light.—A fixed white light, 30 feet above water, visible 6 miles, is shown from a white square wooden structure, on the outer end of the low sand point.

Pointe aux Pins range lights—Front light.—A fixed white light, 28 feet above water, visible 4 miles, is shown from a white square tower on the north end of the point.

Rear light.—A fixed white light, 53 feet above water, visible 4 miles, is shown from a white square tower 307 yards 232° (S. $\frac{1}{4}$ W.) from the front light.

Buoy.—A black spar buoy marks the submerged water intake crib off Big Point.

Brush Point is located opposite Pointe aux Pins. The channel through the lower shoal northeast of Round Island and opposite Cedar Point is 23 feet deep and 325 yards wide.

Gauge for ascertaining available draft.—A gauge is maintained and bulletins are posted at Coast Guard lookout station No. 6, Brush Point, so that masters of deep-draft vessels when passing that station may ascertain the draft of water available.

Range lights—Front light.—A fixed red light with an auxiliary occulting white, 32 feet above water, is shown from a black pyramidal tower in 10 feet of water westward of the point. A fixed red light, 55 feet above water, is shown from a black skeleton tower 1,357 yards 73° (ENE $\frac{1}{4}$ E.) from the front light.

A white slatted day mark is attached to each of the light structures.

There is a range lead through the river from Pointe aux Pins to the Round Island range.

Light buoys.—A black conical buoy, showing an occulting white light, is moored in 25 feet off Brush Point.

A black conical buoy, showing an occulting white light, is moored in 23 feet on the south side of the channel abreast Cedar Point.

Buoys.—A black spar buoy is moored just westward of the front range light.

A red spar buoy is moored on the northern side of the channel opposite Cedar Point.

Round Island lies on the southern side of the river westward of Cedar Point. Shoal water extends 660 yards northward from it.

Range lights—Front light.—A fixed white light, 50 feet above water, is shown from a black pyramidal skeleton structure, on the northwest edge of Round Island.

Rear light.—A fixed white light, 70 feet above water, is 205 yards 121° (SE. by E.) from the front light.

A white oval slatted daymark is attached to each of the light towers.

These in range lead from their intersection with the Brush Point range to the Birch Point range.

Gros Cap.—From Pointe aux Pins the northern shore trends northwesterly about $7\frac{1}{2}$ miles to Gros Cap. A shoal bank extends about $1\frac{1}{2}$ miles off this shore.

Light buoy.—A red conical buoy, showing an occulting red light, is moored on the outer edge of the shoal bank northeasterly of Middle Ground.

Buoys.—The shore bank between Pointe aux Pins and Gros Cap is marked on the outer edge by 4 red spar buoys.

Middle Ground Shoal lies in the center of the channel on the Birch Point range line. It is 1,320 yards long east and west and 660 yards greatest width. It has a least depth of 7 feet.

Buoys.—A horizontally striped buoy is moored close off the easterly edge of this shoal; a black can buoy marks the most northerly edge.

Channel.—The channel northward of Middle Ground Shoal is 333 yards wide and 23 feet deep. Cedar Point range lights lead through it.

Birch Point is about $1\frac{1}{2}$ miles southwestward of Cedar Point. Shoal water extends 1,540 yards off from it.

Range lights—Front light.—A fixed white light, 53 feet above water, is shown from a black square pyramidal tower on Birch Point.

Rear light.—A fixed white light, 78 feet above water, is shown from a black square tower 323 yards 139° (SE. $\frac{1}{2}$ S.) from the front light.

A white daymark is attached to each light tower.

These in range lead from their intersection with the Cedar Point range to Lake Superior.

Shore.—The southern shore from Birch Point to Point Iroquois is indented with a large shoal bay and is fronted by shoals.

Point Iroquois Shoals extend nearly 2 miles offshore and are about $1\frac{1}{2}$ miles wide at the outer end.

Light buoy.—A black conical buoy, showing an occulting white light, is moored in 20 feet at the east edge of Point Iroquois Shoals.

Buoy.—A black spar buoy marks the northerly edge of the shoals.

Gros Cap Reefs comprise seven detached rocky reefs with 16 to 19 feet of water over them, lying from 1 to 1.8 miles in a south-westerly direction from Gros Cap. The shoalest spot lies $2\frac{1}{2}$ miles north-northeast of Point Iroquois Light. Vessels should pass to westward of this buoy. A detached reef of bedrock with 4 feet least depth lies 300 yards west-northwest from Gros Cap.

Light and bell buoys.—A red cylindrical buoy, showing an occulting red light, is moored in 20 feet on the west end of the reef.

Fog signal.—The fog signal is made on a bell sounded by the action of the waves.

Directions.—The courses and distance in statute miles being all laid down on the charts of the St. Marys River, it is unnecessary to repeat them here. It must be remembered, however, that the given courses on these United States Government charts are true, and for the compass courses the westerly variation has to be applied. This ranges (1920) from 5° at Point Detour to 31° at Sault Ste. Marie.

Navigation routes—Dimensions of channels.—From Point Iroquois to the canals, a distance of 14 miles, there are six vessel courses and the channel has a least width of 800 feet (abreast of Point aux Pins Light), with a least depth of 23 feet, except at Vidal Shoals, where improved to a clear depth of 22 feet. Navigation around the rapids at Sault Ste. Marie is provided for by canals and locks on both the United States side and the Canadian side. Between the canals and light No. 27 at the upper end of the Little Rapids cut into Hay Lake the channel has a minimum width of 1,000 feet; the limiting depth is 20.8 for the southerly 700 feet width of the channel, but at Bayfield Shoal, in the northerly 300 feet width, spots have been found having least depth of about 20 feet.

At the head of Sugar Island, about 2 miles below the canal locks at Sault Ste. Marie, the channel divides. The old line of travel, known as the Lake George route, passes to the northward and eastward of Sugar Island through Lake George and East Neebish, while the other line, known as the Hay Lake route, passes to the west of Sugar Island, through Hay Lake. Between Hay Lake and Mud Lake two channels have been provided passing on either side of Neebish Island. The West Neebish Channel, opened in 1908, passes on the west side of the island and is for the use of downbound traffic. The upbound channel (formerly used both ways) leads from the head of Mud Lake to eastward and northward of Neebish Island, traversing the Sailors Encampment Channel, Little Mud Lake, the Middle Neebish Channel, and the cut through the shallow area in lower Hay Lake. The East Neebish Channel of the Lake George

route connects with this upbound channel at the head of Little Mud Lake.

The distance from Point Iroquois to Detour by the Hay Lake route is 63 miles and by the Lake George route 75 miles. The least width of channel by way of Hay Lake is 300 feet; the general width is 600 feet or more, and the least depth is 21 feet. The least width of channel by way of Lake George is 150 feet, and the least depth about 13 feet. The Hay Lake route, being comparatively straight in its reaches, can be navigated with reasonable safety at night, but this is not the case with the crooked Lake George route, especially as this route is not lighted. The Lake George route is marked by buoys and day mid-channel ranges, and the Hay Lake route is well defined by numerous lights and buoys, the details of which are given in the printed lists issued by the United States Bureau of Lighthouses.

There is another important channel, known as the St. Joseph Channel, with least depth of about 13 feet, which leaves the Lake George Channel near its connection with the Middle Neebish Channel, at the south end of Sugar Island, and passing to the northward and eastward of St. Joseph Island leads into North Channel, and thence to Georgian Bay by way of Clapperton Main Passage and Little Current, or directly into Lake Huron through channels on the east and west sides of Cockburn Island, called, respectively, Mississagi Strait and False Detour Channel. These channels are all in Canadian waters.

Fluctuations of water surface.—Each year the St. Marys River rises and falls about 1 foot as measured by the monthly mean levels. In the past 59 years the difference between the highest and the lowest monthly mean levels above the locks has been about $3\frac{1}{2}$ feet and below the locks about 5 feet. From day to day the level fluctuates somewhat, due to wind and barometric pressure, such changes frequently amounting to several inches and sometimes to a foot or more. In addition to these changes in level, occasionally a considerable oscillation takes place within two or three hours, which is somewhat in the nature of a seiche; such changes amounting to over 5 feet have been known to occur within three hours. As much of the present sailing route in the St. Marys River has been made navigable by dredging, the changes in level have a direct effect on the available draft.

Season of navigation at St. Marys Falls Canals.

	Opening.	Closing.
Average dates since 1855.....	April 26	December 6
Average dates during last 20 years.....	April 17	December 18
Dates, 1918, United States canals.....	April 20	December 14
Dates, 1918, Canadian Canal.....	April 23	December 17

Schedule of distances and times.

Courses.	Distances, statute miles.	Minimum time in min- utes at speed of 10 miles per hour.	Maximum time allowed vessels towing more than one barge.
UPBOUND.			
Everens Point to Encampment Crib Light.....	0.8	5	10
Encampment Crib Light to Dark Hole turn.....	1.6	10	20
Dark Hole turn to Harwood Point turn.....	3.3	20	40
Harwood Point turn to Junction Light No. 8.....	3.3	20	40
Junction Light No. 8 to gas buoys Nos. 10 and 11.....	2.8	17	34
Six Mile Point Rear Light No. 20 to Frechette Point Front Light No. 21.....	1.5	9	18
Frechette Point Front Light No. 21 to Lower West Light No. 23	1.5	9	18
Lower West Light No. 23 to North Entrance Light No. 27....	1.5	9	18
North Entrance Light No. 27 to east end of Brady Pier.....	1.6	10	20
South Pier West End Light to Big Point.....	2.3	14	28
Big Point to Brush Point.....	2.3	14	28
Brush Point to intersection of Birch Point and Cedar Point ranges.....	5.0	30	60
DOWNBOUND.			
Intersection of Birch Point and Cedar Point ranges to Brush Point.....	5.0	30	60
Brush Point to Big Point.....	2.3	14	28
Big Point to Center Pier West End Light.....	2.6	16	32
East end of Brady Pier to North Entrance Light No. 27....	1.6	10	20
*North Entrance Light No. 27 to Lower West Light No. 23...	1.5	9	18
*Lower West Light No. 23 to Frechette Point Front Light No. 21.....	1.5	9	18
*Frechette Point Front Light No. 21 to Six Mile Point Rear Light No. 20.....	1.5	9	18
Entrance cribs Nos. 24 and 25 to Hay Point turn, crib No. 22...	2.0	12	24
Hay Point turn, crib No. 22, to Sand Island cribs Nos. 17 and 18.	2.8	17	34
*Sand Island cribs Nos. 17 and 18 to Lookout Station No. 4...	1.8	11	22
Lookout Station No. 4 to lower gas buoy No. 12.....	2.5	15	30
*Upper dam to lower dam.....	1.7	10	20
Lower gas buoy No. 12 to Lookout Station No. 5.....	2.8	17	34
Lookout Station No. 5 to lower cribs Nos. 1 and 2.....	1.8	11	22

*Here expect strong current.

Lake George is the sheet of water east of Sugar Island. The lake is 10 miles in length north and south by 4 miles in greatest width. Its southern end is 4 miles from the northern extremity of St. Joseph Island; the intervening water was formerly called East Neebish Channel. The northern end of the lake is $14\frac{1}{2}$ miles (by the channel) eastward of the Sault Ste. Marie Canals. This lake and connecting waters were at one time used for general navigation, but now all through traffic goes west of Sugar Island, nothing but local traffic using the old route, by which, however, 13 feet water can be carried from St. Joseph Channel to Sault Ste. Marie by narrow and mostly tortuous channels, which, though buoyed, are not lighted, and should not be used except by those locally acquainted.

CHAPTER XX.

LAKE SUPERIOR.

The depths in this chapter are referred to low-water datum for Lake Superior, which is an elevation 601.6 feet above mean sea level. Depths on Lake Survey charts are 1 foot less than those given in this chapter except on charts of Agate Harbor and Eagle Harbor, which are about 1 foot more.

Plan.—The plan of this chapter is to give a general description of the lake; then beginning with Point Iroquois to describe the southern shore in detail from east to west, afterwards proceeding from west to east along the northern shore.

Lake Superior is the largest body of fresh water on the globe, having an area of 31,200 square miles, and is the highest and most western of the five Great Lakes. Its general form is that of a wide crescent with the outer curve to the north. Following the curve of its axis from west to east the lake is about 365 miles long, and its greatest breadth is 160 miles. Its maximum recorded depth is 1,008 feet in the middle of the lake near the 87th meridian, though greater depths have been found, and its height above the sea level is 602 feet. The surface of the lake is about 23 feet above that of Lake Michigan and Lake Huron, and it receives the waters of 200 rivers and drains a territory of about 53,000 square miles. The largest river which empties into Lake Superior is the St. Louis, at its western end. The rivers on the northern shore are the Pigeon, about three-quarters of the way to Port Arthur; the Nipigon, which drains the lake of the same name, and which, together with the lake, is about 200 miles long; the Pie, the White, and the Michipicoten. No rivers of large size empty into it from the south.

There are not many islands in this lake, the largest being Isle Royal, 44 miles long; Michipicoten Island, in the eastern part; St. Ignace, in the northern part, off the mouth of the Nipigon River; Grand Island, between Pictured Rocks and Marquette; Manitou Island, east of Keweenaw Point, and the Apostle Group, to the north of Chequamegon Bay.

The boundary between the United States and Canada starts from the outlet of the lake into the Sault Ste. Marie, and sweeps northward so as to include Isle Royal within the territory of the United States, 13 miles from the Canadian Shore, and thence inland to the

westward from the mouth of the Pigeon River. The greater part of the lake thus belongs to the United States, though Canada owns the north shore.

Fogs.—The water of Lake Superior is remarkably pure, cold, and transparent, and objects may be easily distinguished at a depth of 25 feet. On account of the coldness of the water fogs are frequent and often attended with considerable damage to shipping from grounding, one notable peculiarity and danger being the aberration of sound, causing fog signals to become inaudible and unreliable at certain distances. Many instances are known where the steam from a whistle may be seen over the fog bank but no sound could be heard from the same.

Mirages are frequent and very deceptive, and storm waves are quickly and suddenly raised, sometimes having a range as high as 18 feet.

The foregoing remarks are not peculiar to Lake Superior alone, but apply as well to each of the other Great Lakes.

Lake Superior has an approximate coast line of 1,200 miles, without counting the Apostle Group, Isle Royal with its fjords and bays, and smaller islands. About 700 miles of this coast line is American territory, facing the States of Minnesota, Wisconsin, and Michigan; the other 500 miles are in Canadian territory. On the American shores of Lake Superior are numerous ports of entry, harbors of refuge for large ships and coasting craft, and innumerable anchorages, roadsteads, and other stopping places not ports of entry.

Storms.—The prevailing storms are from the northeast and northwest. The natural route of United States commerce near the southern side lies, therefore, throughout its whole extent along a lee shore. During storms the water rises less on the lee shore and falls less on the weather shore than it does on the shoaler lakes, as the greater depth of water allows the lower return currents to flow more freely.

During the summer months the perils of navigation are mainly those of fog and squalls, the latter occurring almost invariably in connection with thunderstorms. In the spring and autumn the lake is stormy and dangerous.

CURRENTS IN LAKE SUPERIOR.

The main current of Lake Superior is to the eastward, along the south shore. From the Apostle Islands to the eastward of Keweenaw Point this current has great width, and toward the eastern end of the lake spreads out in the shape of a fan, while a branch passing to the northward and westward reaches the extreme northern coast of the lake.

Another branch turns to the southward, around Keweenaw Point, reaches the south coast, moves to the eastward, and again joins the main current east of Marquette, Mich. In Whitefish Bay there are evidences of a whirl, and to the westward of the Apostle Islands a distinct westerly set exists.

Along the northwest coast the current moves to the westward, turning, apparently, to the eastward near Two Harbors, Minn.

An interesting confirmation of the main current is found in the drift from wrecks. From the "Currents of the Great Lakes, as deduced from the movements of Bottle Papers during the seasons of 1892 and 1893," published by the Weather Bureau, it is learned that a considerable portion of oil jettisoned from the steamer *Northerner*, stranded on Keweenaw Point in November, 1892, was recovered at Deer Park, between Grand Marais, Mich., and Whitefish Point, on the south shore of the lake, distant over 200 miles. Many barrels of oil were chopped out of the ice by the life-saving crew and fishermen at Deer Park.

Isle Royal furnishes indications of a current from the northeast in the sand spits extending to the southwest. This is very distinctly shown along several small islands on the southern shore.

Fluctuations of water level.—The average or normal elevation of the lake surface varies irregularly from year to year. During the course of each year the normal level is subject to a consistent seasonal rise and fall, reaching its lowest stage usually at about the close of winter and attaining its highest stage during the late summer. In the last five years, the highest annual stages (taking the maximum monthly mean height of each year) have ranged from 0.92 to 2.21 feet above low-water datum, and the lowest annual stages (taking the minimum monthly mean height of each year) have ranged from 0.28 foot below to 0.55 foot above low-water datum, to which depths are referred in the descriptions following. In the 60 years from 1860 to 1919, the difference between the highest (604.08) and the lowest (600.53) monthly mean stages of the whole period was 3.55 feet; the greatest annual fluctuation as shown by the highest and the lowest monthly means of any year was 2.67 feet, and the least annual fluctuation was 0.53 foot.

Through joint action on the part of the United States and Canada, the fluctuation of Lake Superior is being regulated by compensating works located in the St. Marys River at the head of St. Marys Falls, which consist of dikes and sluice gates so operated as to vary the volume of discharge from the lake. The purpose of this regulation is to neutralize the changes in flow consequent upon diversions of water around the rapids for power development, and to limit the fluctuation of the lake surface within an ordinary range of 1.5 feet, between

elevations of from 0.5 foot to 2 feet above low-water datum, and within a maximum range of 2.5 feet above low-water datum.

In addition to the annual fluctuation, there are occasional oscillations of irregular amount and duration. Sometimes these are apparently seiches, resulting from variations in barometric pressure, which may produce changes ranging from a few inches to several feet, and return to the normal, within a few hours. At other times the level is affected by winds of sufficient velocity to drive the surface water forward in greater volume than that carried by the lower return currents, thus raising the elevation on the lee shore and lowering it on the weather shore. These wind-produced changes may range in amount up to about 2 feet, dependent upon the violence of the storms which occasion them, but seldom exceed 1 foot above or below normal level, and their duration is governed by the sustained force of the winds. The unusually severe storm of November 28, 1905, temporarily raised the water level in Duluth Harbor to 2.3 feet above the normal or unaffected stage of the lake at the time.

Storms.—The prevailing storms are from the northeast and northwest. The natural route of United States commerce near the southern side lies, therefore, throughout its whole extent along a lee shore. During storms the water rises less on the lee shore and falls less on the weather shore than it does on the shoaler lakes, as the greater depth of water allows the lower return currents to flow more freely. During the summer months the perils of navigation are mainly those of fog and squall winds, the latter occurring almost invariably in connection with thunderstorms. In the spring and fall the lake is stormy and dangerous.

Fog.—The area of greatest frequency of fog, according to the reports of the Weather Bureau, is east of Keweenaw Point and northward of Au Sable Point, a district almost coincident with that of lowest water temperatures. Less fog is reported on the coast from Au Sable Point to Marquette and Portage Entry, and the Weather Bureau regards the Keweenaw Waterway as a more acceptable route for upbound boats during the months of June, July, and August, since there will be much less liability to loss of life and property by following this line than for all vessels to lay their courses, both up and down, around Keweenaw Point.

Magnetic attraction.—Local magnetic attraction, or disturbance of the compass needle, is more prevalent than on the other lakes. Reports of vessel masters agree that it is strongest at particular localities along the northern shore; that it decreases in intensity as the distance from this shore increases, and that the tendency is to draw upbound vessels in toward the north shore. It is quite generally believed to have contributed toward a number of strandings along the

north shore. A number of masters have reported a local attraction on the course from Devils Island to Duluth, but their statements are rather indefinite and discordant, and some of them affirm that the chart variations are correct for this course.

Improved harbors.—Compared with others of the Great Lakes, Lake Superior was fairly well provided with natural harbors, and works of improvement have created additional harbors of refuge at various points. One class of improved harbors consists of bays of generally deep water, having wide mouths of openings toward the lake, which have been provided with breakwaters to close partially the natural openings and form the desired protection. Such harbors are Marquette, Mich., Presque Isle, Mich., Two Harbors, Minn., and Grand Marais, Minn. In this connection may be mentioned Keweenaw upper entrance and Superior Entry, where breakwaters form protected basins which are entirely artificial. Chequamegon Bay, on which the harbor of Ashland is situated, is protected from lake storms, but has so large an area that breakwaters have been built for protection against waves generated within the bay. The first general type of breakwater construction consisted of timber cribs filled with rock ballast and resting upon an embankment of riprap. At Marquette the timber-crib superstructure of the old breakwater has been replaced by concrete, and an extension of rock rubble mound built. The rubble-mound type has been adopted at Ashland and Superior Entry. The greatest depth in which these breakwaters have been built on Lake Superior is 56 feet, at Two Harbors, Minn.

A second class of improved harbors consists of those whose entrances are formed by parallel piers or jetties extending from the shore out across a bar of gravel or sand to the desired depth of water, the primary object being either to confine the currents to a fixed and narrow width in order to scour out and maintain the channel to the depth needed, or to prevent an improved channel from being filled by drifting sand. Such harbors are Duluth, Minn., Port Wing, Wis., Ontonagon, Mich., and Grand Marais, Mich. Portage Entry in Keweenaw Bay affords an illustration of a dredged channel protected from waves and drifting material by a single breakwater pier. In later years deeper channels have been required than could be obtained by the scouring action of the currents alone, and dredging has been resorted to. In the harbors at the mouths of rivers the enlargement of the channels by dredging has reduced the velocity of the outgoing currents and changed their action from that of scouring to that of depositing silt or coarser material, so that further dredging from time to time has become necessary. Therefore, the jetty piers now serve only to protect the improved channels from the filling up which would result from the action of storm waves and the so-called littoral currents.

Point Iroquois is the southwestern entrance point to the St. Marys River.

Shoal water, with a depth of about 17 feet on its outer edge, extends about 1,320 yards in a northeasterly direction from the point.

Point Iroquois Light, flashing white, 73 feet above water, visible 16 miles, is shown from a white, conical, stone tower, with a dwelling attached, on the point.

Fog signal.—The fog signal is made on a steam whistle.

Whitefish Bay.—From Point Iroquois the land extends to the westward about 20 miles and then to the northward about the same distance to Whitefish Point, forming the southern and western sides of Whitefish Bay. The distance across the bay from Gros Cap Reef to Whitefish Point is about 25 miles.

Nadoway Point lies about 2 miles westward of Point Iroquois. A rocky flat extends $1\frac{1}{4}$ miles offshore around the point, with depths from 15 to 18 feet 1 mile out. From Nadoway Point to Salt Point the shore is steep-to.

Salt Point lies about 11 miles westward of Point Iroquois; shoal water extends off about 880 yards northward of it and a little more than that distance to the northwestward.

Taquamenon Bay, the southwesterly corner of Whitefish Bay, is very shallow and rocky, and the shoal water extends off to a line running from Salt Point northwesterly through Taquamenon Island, the latter lying about 4 miles easterly from the north point of the bay.

Emerson is located on the north point of Taquamenon Bay; a private channel affording about 13 feet draft leads from the deeper water of the bay northerly to the lumber wharves.

Beacon.—A private day beacon marks the extremity of the shoal bank extending southward from the north point of Taquamenon Bay on the east side of the channel.

Coast.—From Emerson northerly about 9 miles to Shelldrake the shoal border diminishes in offshore extent, being about 1 mile wide at the latter place.

Shelldrake is a small settlement at the mouth of Shelldrake River, on the west side of Whitefish Bay, $7\frac{1}{4}$ miles southerly from Whitefish Point. A large sawmill is located here, and a lumber wharf runs out into about 15 feet of water. A vessel drawing 10 feet can go in 167 yards to 200 yards from the end of the wharf on the south side. About 100 yards south of the lumber wharf there is a pile pier in about 15 feet of water, connected with the shore by a railroad trestle.

From 1 mile north of Shelldrake River to Whitefish Point the shore may be approached with safety to within 880 yards.

Endress (Booth) Dock is on the west shore of Whitefish Bay, about 880 yards from the end of Whitefish Point. The post office of Whitefish Point is located here. A pile wharf, with wide deck and in good condition, has about 12 feet of water for 250 feet in from the outer end. A new Endress pile wharf, built in 1914 about 880 yards south of the above wharf, is about 200 feet long, with 10 feet of water at its outer end. (Information of December, 1919.)

Whitefish Point is the point of land at the northwestern end of Whitefish Bay, and is the turning point for vessels bound into Lake Superior and for vessels bound in the opposite direction for St. Marys River.

Light.—A flashing white light, 76 feet above water, visible 17 miles, is shown from a white skeleton tower on Whitefish Point.

Fog signal.—The fog signal is made on a steam whistle.

Submarine bell.—There is a submarine bell in 80 feet located 2,185 yards north of the lighthouse.

Buoy.—A black spar buoy marks the location of the submarine bell.

Caution.—Vessels should give this buoy a good berth in passing, and should not anchor to the southward or eastward of it, to avoid fouling the cable connecting the bell with the shore.

Radio compass station.—There is a radio compass station under construction.

Anchorage.—There is a good safe anchorage from northwesterly gales under the lee of Whitefish Point south of the light; the water is deep and it is necessary to come to close to the shore; the best anchorage is a little south of the dock.

Storm signals.—Day and night storm warnings are displayed from a steel tower located about 220 yards east-northeast of the lighthouse.

Coast.—From Whitefish Point to Grand Marais, about 49 miles westward, the shore is generally bold, but should be given a berth of 1 mile to avoid the rocky reefs extending 880 to 1,320 yards offshore.

Crisp Point is about $14\frac{1}{2}$ miles west of Whitefish Point.

Light.—A fixed red light, 62 feet above water, visible 15 miles, is shown from a white, conical, brick tower on Crisp Point.

Fog signal.—The fog signal is made on a steam whistle.

Coast Guard stations are located as follows: One at Vermilion Point, 10 miles west of Whitefish Point; one at Crisp Point; one near the mouth of Big Two Hearted River, $26\frac{1}{2}$ miles east of Grand Marais; and one at Deer Park, $15\frac{1}{2}$ miles east of Grand Marais and near the mouth of Sucker River. Day storm-warning signals are displayed at Deer Park from a flagstaff on the bluff back of the Coast Guard station.

Wreck.—The wreck of a wooden steamer lies $12\frac{1}{2}$ miles west of Whitefish Point, and about $2\frac{1}{2}$ miles east by north from Crisp Point Coast Guard station, about 590 yards from shore and outside of the first reef, in a depth of about 18 feet with 14 feet directly inside on the reef. It has gone to pieces below the water line. While dangerous for yachts or small boats, the wreck is too far inshore from the usual course of vessels to obstruct navigation.

Grand Marais (harbor of refuge) is about halfway between Whitefish Bay and Grand Island, and the only harbor of any kind in this stretch of about 90 miles of dangerous coast, along which numerous wrecks have occurred; it is therefore useful as a harbor of refuge. Local commerce has declined with the exhaustion of the timber.

Piers.—The entrance to the harbor, about 167 yards wide, is protected on either side by parallel crib piers, which are ripped with large rock on both sides and at the outer ends. The east pier is 515 yards long, including 100 feet of pile dike, but exclusive of the wing at the inner end, and extends 481 yards beyond the shore line. The west pier is 637 yards long, including 100 feet of pile dike, and extends 317 yards from the shore and 115 yards farther into the lake than the east pier.

The superstructure of the outer 64 yards of the east pier and 85 yards of the west pier is but 12 feet wide, covering only one-half of the width of the pier, and leaving a low deck 12 feet wide and 1 foot above low-water datum on the channel side of each pier. Along the base of these extensions riprap was placed, extending about 15 feet from the piers and sloping down to the bed of the channel. The depth over the riprap close to the piers, where the riprap is highest, is generally 14 feet; the least depth is 10 feet, which is next to the west pier at a point about 220 feet from its outer end.

Channel.—There is a channel 95 yards wide with a present depth of 20 feet or more through the bar in the lake approach, and 220 feet wide and 18 feet deep between the piers. The middle of the deep water is on the axis of the entrance. The easterly 380 feet width of the lake approach has a depth of 19 feet or more.

Range lights—Front light.—A fixed red light, 40 feet above water, visible 9 miles, is shown from a white square pyramidal tower on the outer end of the pier.

Rear light.—A fixed red light, 54 feet above water, visible 10 miles, is shown from a white square pyramidal tower 590 yards 177° (S. $\frac{1}{3}$ E.) from the front light.

These in range indicate the direction of the channel.

Fog signal.—The fog signal is made on a bell at the front lighthouse.

Radio compass station.—A radio compass station is under construction.

Dike.—A pile dike extends across the natural entrance, from the east pier of the ship canal to Lonesome Point, to protect the harbor from storms and prevent the movement of sand into the harbor.

Note.—Vessels should not go alongside the piers, as the water over the riprap stones is very shallow.

There are no harbor lines established and no special rules or regulations in force.

Sand fences.—There are board fences a short distance west of the west pier of the entrance to arrest the movement of sand carried by westerly and northwesterly winds into the channel. There are three parallel lines of fence, approximately at right angles to the sand movement.

Coast Guard station is located on the west side of the harbor entrance, 130 yards west of the rear range light.

Storm warnings.—Day and night signals are displayed from a steel tower on the Coast Guard reservation, about 267 yards from the lake.

Au Sable Point lies 8 miles to westward of Grand Marais. The coast between curves inward and has no outlying dangers.

A shoal extends about 1 mile to the northwestward of the light-house on Au Sable Point.

Light.—A fixed white light, 107 feet above water, visible 19 miles, is shown from a white conical brick tower on Au Sable Point.

Fog signal.—The fog signal is made on a steam whistle.

Coast.—From Au Sable Point southwestward about 25 miles, past the Grand Portal, Sail Rock, and to $2\frac{1}{4}$ miles beyond Castle Point, the coast is free from dangers.

Pictured Rocks.—Precipitous cliffs of red sandstone extend along the latter 14 miles of this stretch, and which, from the marked effect of wave action, have received the name of Pictured Rocks.

Grand Island lies in the bight forming South Bay and Grand Island Harbor. It is about $7\frac{1}{2}$ miles long in a north and south direction, and about 1 mile wide at its lower end to $3\frac{1}{2}$ miles at its upper end. On its southeastern side is a small peninsula 3 miles in length and about 1 mile wide connected to the island by a low narrow strip of land about 1 mile in length.

The island is bordered by ridges of high land and is surrounded by shoal water 220 to 1,320 yards offshore, and should be approached close-to with caution. Trout Bay lies on the east side between the main island and the small peninsula. Trout Point is at the northern end of the small peninsula, from which a shoal with 14 feet on it extends 1,100 yards to the northward.

Grand Island Light, fixed and flashing white, visible fixed, 20 miles, flashing 24 miles, is shown from a yellow square tower on a brick dwelling on the northwest point of the island.

Grand Island Harbor is the deep area lying south of Grand Island and including South Bay forms, during northerly storms, a refuge for the largest class of vessels plying the Great Lakes. The anchorage is to the south of Grand Island anywhere eastward of Williams Landing; the holding ground is good.

Eastern approach.—The approach to the harbor from the eastward is through the narrows between Grand Island and the shoal, awash, lying 590 yards northwesterly from Sand Point.

Light and bell buoy.—A black conical buoy, showing an occulting white light, is moored in 21 feet on the edge of the shoal northwest of Sand Point.

Fog signal.—The fog signal is made on a bell operated by the action of the waves.

Buoy.—A red spar buoy marks the outer edge of the shoal extending eastward from Grand Island at the narrows.

Munising Range Lights—Front light.—A fixed red light, 79 feet above water, visible 15 miles, is shown from a white conical steel tower in the town of Munising on the southwestern shore of South Bay.

Rear light.—A fixed red light, 107 feet above water, visible 15 miles, is shown from a white conical steel tower 383 yards 217° (SW. $\frac{1}{4}$ S.) from the front light.

These in range lead through the channel east of Grand Island up to the town of Munising.

Directions from eastward.—Vessels entering from the eastward after passing Castle Point with a berth of 440 yards, steer 217° (SW. $\frac{1}{4}$ S.) on the Munising Range which leads through the narrows between the eastern shore of Grand Island and the mainland up to Munising.

Munising is situated at the head of South Bay, Grand Island Harbor. It has railroad, telegraph, and telephone connections, and its market facilities are fair. There are numerous wharves, all in poor condition, with deep water up to them.

Storm signals.—Day and night storm warnings are displayed from a steel tower on the east side of Beach Inn, about 80 yards from the bay shore.

Western approach.—This approach to Grand Island Harbor is more difficult than the eastern. The passage lies with Grand Island on the east and north sides of it and with Wood and William Islands and the mainland on the west and south sides.

Caution.—In rounding the southwesterly point of Grand Island, the very shallow, sandy shoal reaching about 880 yards out must be avoided.

Light and bell buoy.—A black and white conical buoy, showing an occulting red light, is moored in 54 feet off the south end of Grand Island.

Fog signal.—The fog signal is made on a bell sounded by the action of the waves. This buoy marks the turning point from the west entrance range.

Buoy.—A black spar buoy marks the extreme southerly end of the shoal off the south end of Grand Island.

Grand Harbor Range lights—Front light.—A flashing white light is shown from a white square wooden tower in the middle of the bight west of Powell Point.

Rear light.—An occulting white light, 72 feet above water, visible 16 miles, is shown from a black conical steel tower 250 yards 164° (SE. by E. $\frac{1}{2}$ E.) from the front light.

These in range lead through that part of the passage west of Grand Island.

Directions from westward.—Vessels bound into Grand Island Harbor and South Bay from the westward should steer in on the Grand Island Range until reaching the light and bell buoy, then steer 85° (E. $\frac{1}{2}$ N.), taking care to avoid the shoal extending off the southern end of Grand Island and pass between Powell Point and Williams Landing; after which take up anchorage as desired.

Williams Island lies $1\frac{1}{2}$ miles west of Grand Island and 1,320 yards northeast from the nearest point of the mainland. Shoal water and numerous rocks, with 6 to 8 feet least depths, extend from the south point of Williams Island south to the main shore, and strangers should not attempt this passage.

Wood Island lies $1\frac{1}{4}$ miles westward of Grand Island and $1\frac{1}{2}$ miles northwestward of Williams Island. It is nearly 1 mile long northwest and southeast and 880 yards wide. Shoal water extends for about 660 yards off the northwestern and southeastern ends and 400 yards from either side.

There is a good passage between Wood Island and Williams Island on a 285° (WNW. $\frac{1}{2}$ W.) course to abreast of Laughing Fish Point, but a sharp lookout should be kept to avoid the 9-foot detached reef $1\frac{1}{2}$ miles 5° (N. $\frac{1}{2}$ E.) from Au Train Point, this being the outermost patch of shoal water extending off this point.

Au Train Bay, about 5 miles to the westward of Grand Island, is a square indentation about $3\frac{1}{2}$ miles across, opening between Au Train Point on the east and Au Train Island on the west; it has deep water, with clean shores at its head. Between Au Train Island and the

main shore are shoals with least depth of 10 feet. A rocky spit with depths of 7 to 16 feet extends 1 mile in a northwest direction from the northerly point of Au Train Island. A 16-foot detached rocky shoal lies in the middle of Shelter Bay, $1\frac{1}{4}$ miles 264° (W. $\frac{1}{4}$ S.) from the south point of Au Train Island and 1 mile north of the mouth of Rock (Laughing Fish) River.

Coast.—Around Laughing Fish Point, which is about 16 miles westerly of Grand Island light, and thence 7 miles southwesterly to Shot Point, the shore is of irregular outline and rocky, and should not be approached nearer than 1,320 yards; shoal water sets out from Shot Point in a north-northeast direction for 1,320 yards, with depths of 15 feet or less. The shore westward from Shot Point to Marquette, about 10 miles, is generally deep-to, with sandy beach. In this stretch, just southeast of Marquette, there are detached rocks extending 800 feet in a west-northwest and east-southeast direction; the easterly end, nearly awash, lies about 1,167 yards 340° (N. by W. $\frac{1}{4}$ W.) and the exposed westerly end about 1,367 yards 331° NNW. $\frac{1}{4}$ W.) from the mouth of Chocolay River. There are two detached rocks lying 467 yards 67° (NE. by E. $\frac{1}{4}$ E.) and 367 yards 106° (ESE. $\frac{1}{4}$ E.) from Marquette light, with a rock nearly awash about 200 yards east of the light; a very shallow bank connects the southerly rock with the main shore, and extends about 200 yards to the eastward beyond it. The standpipe of the Cleveland Cliffs Iron Co. on Mount Mesnard, south of Marquette, is a prominent landmark from the lake.

Marquette Harbor is at the north end of Marquette Bay and, by steamer track, about 143 miles from the head of St. Marys River and about 40 miles from Grand Island, the nearest safe natural shelter. It is a most important ore-shipping point and possesses immense ore docks.

The harbor contains a number of wharves, between which and the breakwater to the east there is generally 20 to 30 feet of water. A shoal area formerly existing in the northerly and most sheltered part of the harbor was removed by dredging during 1910 and 1911 to a depth of 20 to 22 feet for the full width from the wharves easterly to the breakwater and to within 50 feet of the harbor line along the north end of the harbor, except for a spot with $19\frac{1}{4}$ feet, located 306 yards 77° (ENE. $\frac{1}{4}$ E.) from the Duluth, South Shore & Atlantic Railroad ore dock. There is a controlling depth of 22 feet in the approach to and alongside of this ore dock, which is the one used by vessels. The area protected wholly or in part by the breakwater is about 350 acres, the most of which is deep enough for large vessels, and the anchorage is good. Vessels are not allowed to make fast to the breakwater and care should be taken in anchoring to see

that they do not swing around against it. There is an established harbor line, but no harbor regulations.

Marquette Light, flashing white, 77 feet above water, visible 17 miles, is shown from a red square tower on a dwelling on the point north of the harbor.

Fog signal.—The fog signal is made on an air siren.

Caution.—In rounding this point vessels should not approach nearer than 880 yards to avoid the rocky bank extending off from it.

Breakwater.—The total length of the breakwater is 1,500 yards and it extends 179° (S. $\frac{1}{2}$ E.) from the point of land east of the city. The superstructure of the breakwater is of concrete and rises 10 feet above the water.

Light.—A fixed red light, 40 feet above water, visible 12 miles, is shown from a white square pyramidal tower at the elbow of the breakwater 500 yards from the outer end.

Light buoy.—A red spar-shaped buoy, showing an occulting red light, is moored in 43 feet 100 yards off the outer end of the breakwater.

Town.—Marquette has a population of 12,718 (1920) and was originally the metropolis of the mining regions of Lake Superior. It possesses immense ore docks and is connected by rail with the large iron-ore mines in the Marquette and Gogebic ranges. There are large manufacturing interests in the city, and in addition to its business advantages Marquette has all the attractions of a cool and delightful summer resort.

Coast guard station is located near the inner end of the breakwater.

Storm warnings.—Day and night signals are displayed from a steel tower on the Marquette County Savings Bank, southeast corner of Washington and Front Streets.

Presque Isle is a rocky point about $3\frac{1}{4}$ miles north of Marquette, with deep water close to shore; detached outcropping rocks lie 880 yards to the eastward of the northern extremity of Presque Isle Point, and a rock pinnacle with but $10\frac{1}{2}$ feet depth over it, lying in deep water about 330 yards east of the middle exposed rock, forms a dangerous outlying menace. Vessels passing this point bound northward out of Marquette Harbor should keep well outside of the exposed rocks, and by keeping the red light on the Marquette Breakwater well open with the main light, clear the obstructions to eastward.

Presque Isle Harbor (Marquette Bay or North Harbor, Marquette).—This harbor is an indentation in the shore north of Marquette Harbor and just south of Presque Isle Point, by which it is protected from northerly and, to some extent, from northeast storms;

The bay is about $1\frac{1}{2}$ miles long and extends into the shore about 880 yards, there being, over the greater part of this area, from 18 to 40 feet of water, with a hard sand and rocky bottom. This port is essentially a shipping point, rather than a harbor of refuge.

Breakwater.—This structure is composed of rock-filled timber cribs, and extends from the shore 405 yards southeastward on the rock reef. The breakwater affords considerable protection to the harbor, so that vessels can lie at the wharves and work during moderate storms, but during severe storms they have to run to Marquette for safety.

Docks.—The present merchandise wharf, north of the old ore dock, has a slip 200 feet wide between it and the ore dock. There is good water only on the south side of this wharf, and to avoid shoal water off its outer end vessels approaching or leaving it should hold toward the old ore dock. The Lake Superior & Ishpeming Railroad has a dock south of the old ore dock, with a slip 220 feet wide between the two. There is a controlling depth of 20 feet in the approach to and alongside the new dock.

No harbor lines are established, and no special rules or regulations are in force.

Shoals at entrance.—A shoal, with 15 feet of water over it, lies about 233 yards southwest of the outer end of Presque Isle Breakwater and nearly on the line of prolongation of the old abandoned ore dock.

A shoal, composed of granite ledge rock, about 90 feet long, 40 feet wide, and with a least depth of $15\frac{1}{4}$ feet, lies 514 yards 134° (SE. $\frac{1}{4}$ E.) from the outer end of the Presque Isle Breakwater, in a surrounding depth of 30 feet or more, and is a serious menace to navigation.

Buoys.—A red spar buoy, in 18 feet of water about 300 yards southwestward from the outer end of the breakwater, marks the southwesterly edge of the shallow area. A red and black horizontally striped spar buoy marks the granite ledge rock shoal.

Light buoy.—A red conical buoy showing an occulting white light is moored in 19 feet about 517 yards south of the outer end of the breakwater, near the point of divergence of the charted sailing lines.

Vessels should pass to the southward of this buoy in entering and leaving the Presque Isle Docks.

Storm warnings.—Day and night signals are displayed from a steel tower immediately across the railroad track north of the Lake Superior & Ishpeming depot.

Rocks.—About 880 yards to the eastward of the northern extremity of Presque Isle Point lie a number of detached rocks. Vessels passing Presque Isle Point bound north out of Marquette Harbor

should keep well outside and to the eastward of the rocks by keeping the red light on Marquette Breakwater well open with the main light.

Coast.—From Presque Isle the coast trends northwesterly for about 23 miles and is generally bold. In Middle Bay, to the westward of Presque Isle Point, a 14-foot spot rising from deep water lies about 467 yards 161° (S. by E. $\frac{1}{4}$ E.) from the east end of the small island off the easterly extremity of Middle Island. Shoal water, with a depth of 15 feet or less, connects the south shore of Partridge Island with the mainland. A reef nearly awash lies in the middle of Partridge Bay; 1,067 yards 285° (WNW. $\frac{1}{4}$ W.) from the south tangent of Partridge Island, and a rocky shoal, with $12\frac{1}{2}$ feet least depth, lies 1,000 yards 264° (W. $\frac{1}{4}$ S.) from the northern extremity of Partridge Island; these shoals are about 617 yards apart and lie to the southward of Larus Island, which is 1,320 yards northwesterly of Partridge Island. Two other small shoals exist in the deeper water of Partridge Bay, one with 13 feet lying about 950 yards 212° (SSW. $\frac{1}{4}$ W.) from the west point of the small island on the west side of Partridge Island, and the other, with $13\frac{1}{4}$ feet, lying about 1,433 yards 261° (W. $\frac{1}{4}$ S.) from the same point and close to the west shore of the bay.

The coast from Granite Point to Big Bay Point Light can generally be approached with safety within 880 yards, except at a point about $1\frac{1}{4}$ miles northwesterly of Sauk Head, where the bank reaches about 1,320 yards offshore, and at Yellow Dog Point, $2\frac{1}{4}$ miles southeasterly of Big Bay Point Light, where the bank extends out about 1,100 yards. Garlic Island lies close to shore midway between Garlic Point and Sauk Head.

Granite Island, with an area of about one acre, lies $5\frac{1}{8}$ miles east-northeast from Garlic Point; it has steep shores with deep water surrounding.

Granite Island Light, fixed white, with a red flash, 89 feet above water, visible 18 miles, is shown from a gray square tower on a dwelling on the island.

Fog signal.—The fog signal is made on a bell.

Stannard Rock, 33 miles 61° (NE. by E. $\frac{1}{4}$ E.) from Granite Island Light and $23\frac{1}{2}$ miles southeast of Manitou Light, consists of two large, detached, rocky shoals. The southerly shoal runs in a south by west and north by east direction, with only a few feet of water on it, and near the southerly edge there is a small rocky island. The northerly shoal extends about 400 yards in a west-northwest and east-southeast direction and about 300 yards in a north and south direction, with very scant depth. Two detached rocky shoals are found to the southwest and west in the immediate vicinity of Stannard Rock Lighthouse; one is a 13-foot shoal lying 500 yards north-

westerly from the beacon, the other an 18-foot shoal 1,200 yards west of the light, plainly to be seen from vessels passing over it in calm weather.

Light.—A flashing white light, 102 feet above water, visible 18 miles, is shown from a white, square tower on a dwelling on the north end of the reef.

Fog signal.—The fog signal is made on a siren.

Beacon.—A day beacon is located on the southern end of the reef.

Big Bay, about 2 miles wide, opens between Big Bay Point on the east and Salmon Trout Point on the west; it is about 12 miles east of the Huron Islands. At Big Bay Point, a shoal with only 6 feet depth near its outer end extends 1 mile northward. The south and west shores of the bay are deep to within 440 yards.

Big Bay Point Light, fixed and flashing white, 105 feet above water, visible 19 miles, is shown from a white square tower on a dwelling on the point.

Fog signal.—The fog signal is made on a steam whistle.

Town.—At the southwest corner of the bay, about 1,320 yards inland and hidden by woods, is the lumber village of Big Bay and mill of the big Bay Lumber Co. A tram leads from the mill down to a wharf extending 500 feet in a northeasterly direction from shore to a depth of 13 feet. The best water is on the northwest side of this wharf, and only at the extreme outer end, as the inshore end has been riprapped with large blocks of sandstone. No lights are displayed. This is a good harbor in all southerly winds.

Coast.—From Salmon Trout Point to Huron River Point, about 8 miles west-northwest, and then westerly about 9 miles to Huron Bay, the shore is generally clear to within 880 yards, but off Huron River Point a shoal, having only 8 to 9 feet depth near its outer end extends $1\frac{1}{2}$ miles in a northeasterly direction and should be carefully avoided. This stretch is marked by the Huron Mountains. Pine River, about $1\frac{3}{4}$ miles southeasterly from Huron River Point, has cottages and a clubhouse, but no landing or shelter.

Huron Islands, lying from $2\frac{1}{2}$ to 4 miles offshore near the entrance to Huron Bay, consists of two groups, both having very bold shores and clean except for two small patches of rocks, awash, off the east end of the easterly group. There is a deep channel $2\frac{1}{2}$ miles wide between the islands and the mainland; also a passage between the islands 1,320 yards wide and 100 feet in depth.

Light.—A fixed white light, 197 feet above water, visible 21 miles, is shown from a gray tower on a dwelling on the northeast side of the northwestern of the Huron Islands.

Fog signal.—The fog signal is made on a steam whistle.

Huron Bay, extends southwesterly about 12 miles, has a width of about 3 miles at its mouth, narrowing to less than $\frac{1}{2}$ mile in its inner reach, and has deep water and generally clean shores. On its west side and separating it from Keweenaw Bay is the peninsula terminating in Point Abbaye.

Light.—A flashing white light, 16 feet above water, visible 7 miles, is shown from a post located on the outer end of the wharf on the eastern shore of Huron Bay.

Skaneec is situated on the eastern shore of Huron Bay southward of Huron Bay Lighthouse. It has a sawmill with wharves which extend to deep water in the bay.

Huron Bay village is an abandoned settlement on the east shore of the bay, at the limit of the deep water near its southerly extremity. The old ore wharf extends from near the shore out to 18 feet depth, and just north of it is the old merchandise wharf; both are in a very advanced stage of decay and are no longer in serviceable condition. The two wharves form between them a slip 100 feet wide, into which vessels drawing 17 feet could enter. It is a good harbor from all winds. There is very shoal water on the outer sides of both wharves.

A small sawmill at the mouth of the river in the extreme end of the bay is inaccessible. Vessels must load from scows.

To the east of Point Abbaye at the northwesterly foot of Huron Bay, a dangerous reef with $4\frac{1}{2}$ feet least depth extends $1\frac{1}{2}$ miles off the northeast extremity.

The northerly edge of this shoal is marked by a black can buoy moored in 19 feet of water. The southeasterly edge is marked by a red nun buoy moored in 21 feet of water.

Keweenaw Bay.—From Point Abbaye, this bay extends to the southwestward about 22 miles, being 12 miles wide at the entrance, with minimum width of about $1\frac{1}{2}$ miles abreast of Sand Point Light, near its head. Its outlying waters are deep and unobstructed, and the shore-line shoals vary in width from 220 to less than 880 yards.

Pequaming is situated on the southerly side of a headland jutting out from the easterly shore of the bay about 14 miles from Point Abbaye, and about 8 miles from Portage Entry; it has a good wharf, deep water, and is well sheltered from all storms. A line of cribs, eight in number, run nearly due east from the outer end of the old wharf and reach across Pequaming Bay nearly to the easterly shore line. These cribs, used for holding a log-storage boom, are from 500 to 1,000 feet from the shore line of the inner portion of the bay, in a depth of 12 to 14 feet of water. The space inclosed for log storage is in shoal water and the cribs do not encroach upon the anchorage area of Pequaming Bay.

Methodist Mission, on the east shore of Keweenaw Bay, $4\frac{1}{2}$ miles from its head and about $3\frac{1}{2}$ miles south of Pequaming, has a wharf for shipment of stone and a good landing for vessels.

L'Anse, a village near the southeast angle of L'Anse, at the head of Keweenaw Bay, is a good harbor in all except north to northeast winds. A merchandise wharf is located on the site of the old ore dock; it extends 200 yards out from shore in a northwesterly direction, with 17 feet of water around its outer end. About 400 feet northeast of the above wharf is the ruin of the old merchandise wharf, owned by the Duluth, South Shore & Atlantic Railroad. The end and southwest side of this wharf are blocked by dangerous submerged wreckage of a steamer. Vessels can carry 10 feet to the northeast side, but the shore approach is entirely gone.

Baraga, on the west side of L'Anse, is a well-sheltered harbor. The Nester (merchandise) Wharf, extending east and west, has a long spur lumber wharf built out from its south side. There is 18 feet of water along the south side of the former in front of the warehouse, and 15 feet along the east face of the spur. About 100 yards north of the merchandise wharf is the Baraga Lumber Co.'s mill and wharf, the latter extending out to 15 feet depth.

Sand Point Light, fixed red, 39 feet above water, visible 10 miles, is shown from a red, square, brick tower on a dwelling just north of Baraga.

Storm signals.—Day and night storm-warning signals are displayed from a steel tower about 130 feet southeast of the lighthouse.

Keweenaw Bay village is on the west shore of Keweenaw Bay, opposite Pequaming and about $7\frac{1}{2}$ miles south of Portage Entry. Mass Consolidated Mining Co.'s stamp mill and coal dock are located at this village, which is a junction point on the Duluth, South Shore & Atlantic Railroad, and has stores and telegraph and post offices. The coal dock is accessible at the end, with from 10 to 17 feet of water along the outer 200 feet of the south side. Vessels can lie there in any wind except a severe northeaster.

Coast.—From Sand Point Light to Portage Entry, the coast should be given a berth of 880 yards.

Portage Entry.—At the Keweenaw Bay entrance, called Portage Entry, there is one timber and stone breakwater pier 3,714 feet long extending from the shore at the east side of the mouth of the river about south by east and terminating in a depth of 21 feet.

In the lake for a distance of about 250 yards outside of the end of the entrance pier the dredging covered a width of 280 feet with depth of 24 to 26 feet. In the lake beyond the limit of dredging there was not less than 22 feet of water. In the channel along and passing 20 to 30 feet off the pier the width of 20-foot water is 260 feet, gradu-

ally narrowing to 160 feet at the inner end of the pier, and through Cut 1 the width was 160 feet. The depth on the vessel range along the middle of these channels was about 22 feet.

Keweenaw Waterway Light No. 4, occulting white, 68 feet above water, visible 16 miles, is shown from an octagonal steel tower on the outer end of the breakwater at Portage Entry.

Fog signal.—The fog signal is made on a siren.

Jacobsville, 1 mile east of Portage Entry, is notable for its quarries of building stone. The principal wharf is the Jacobsville Dock, which formerly extended about 230 yards into the lake, with 20 feet of water at its outer end, affording fair protection from ordinary storms. The wharf was partially wrecked by the gale, about 100 feet of the outer end being carried away, and the submerged wreckage of cribs, derricks, etc., and large sandstone blocks cover an area extending out about 500 feet from the present end of the wharf. This wreckage renders the approach very dangerous, and vessels should cautiously draw near the west side of the present wharf.

Coast.—From Jacobsville 14 miles northeasterly to Traverse Point, the headland separating Little Traverse and Grand Traverse Bays, the shore can be approached to within 880 yards. Traverse Island, $4\frac{1}{2}$ miles south by west from Traverse Point and 2 miles offshore, has a narrow, shallow spit extending 1,320 yards in a south-west direction from its narrow southwest point. The other shores should be given a berth of 220 to 440 yards. Good water is found in the passage $1\frac{1}{4}$ miles wide between Traverse Island and the main shore.

Red Rock is a small settlement 3 miles northeasterly from Portage Entry where building stone is quarried and shipped. There is no natural harbor. A wharf about 265 yards long extends into the lake, affording some protection to vessels, and has an available depth of about 12 feet at the outer end.

From Traverse Point to Bete Grise Bay the trend is northeasterly for about 20 miles; care should be exercised in approaching the coast to avoid the shoal water, extending out in some places nearly 1,320 yards, while at Point Isabelle, which forms the southerly shore of Bete Grise Bay, the shoal rocky bank reaches out 1,540 yards to the northeast.

Gay, a village which is the site of the stamp mills of the Mohawk and Wolverine mines, is situated on a high sandstone cliff on the shore of Keweenaw Peninsula, about 2 miles northeast of Grand Traverse Bay. The cliff and the mill stacks are prominent landmarks from the lake. There are no wharves directly at the village, and vessels must land at the coal dock in the north end of Grand Traverse Bay.

The coal dock extends out in a southwesterly direction from the north shore of Grand Traverse Bay, and vessels bound therefor should be careful not to mistake for it the intake crib extending out from the light-colored masonry pumping station about 3 miles farther northeast. This mistake is especially apt to occur at night, as the pumping station and the nearby stamp mills display electric lights while the dock is unlighted except when coal-laden vessels are expected, and then only by a common lantern displayed on its end. This coal dock affords a fair harbor for launches, small tugs, etc., from any weather, although if the wind were high from the east it might be necessary to tail off from the dock.

Lac la Belle and Bete Grise Bay, Mich.—On the southeasterly side of Keweenaw Peninsula, about 12 miles from Keweenaw Point at the northeast extremity. Lac la Belle is a small inland lake about 2 miles long, 880 yards wide, and 30 feet deep, distant about 1,320 yards from Lake Superior. A canal connects Lac la Belle and Bete Grise Bay.

An examination of the harbor entrance (1911) showed along the axis between the piers and through the canal a least depth of 10 feet, this being between the piers and about opposite the shore line; the depth rapidly increased in both directions. From the bar mentioned to deep water in Lac la Belle there was a depth of from 12 to 15 feet. The outer 300 feet of the south pier and 150 feet of the north pier were under water and the piers were generally out of repair.

It is not probable that any work of improvement will be undertaken in connection with the canal.

Mendota Light, fixed white, 44 feet above water, visible 14 miles, is shown from a buff, square, brick tower on a dwelling on the south side of the entrance to Lac la Belle.

Storm warnings.—Day and night signals are displayed from a steel tower 75 feet north of Mendota Light and 50 feet from the canal.

Harbor.—At the northwest corner of Lac la Belle is Mendota, the terminal station of the Keweenaw Central Railroad. A steamboat wharf, with warehouse thereon, is 156 feet long, with depth along its front of from 12 to 17 feet, the least depth being at the east end. There is good water through the center of Lac la Belle and up to the wharf.

Good anchorage may be had in Bete Grise Bay, northeast of the canal entrance, and also in Lac la Belle. Many vessels take refuge from storms in the shelter of Bete Grise Bay.

Keystone Point, lies about 5 miles easterly from Bete Grise Bay; the coast between is steep to and has no offlying dangers. The point is the summer home of a few fishermen.

Keystone Bay, the first indentation east of Keystone Point and west of Keweenaw Point on the southeasterly side of Keweenaw Peninsula, affords good anchorage and shelter from west through north to northeast.

Keweenaw Point is the most easterly extremity of Keweenaw Peninsula. There is a bowlder shoal, nearly awash, with its outer edge 660 yards south of Keweenaw Point, but with this exception good water is found to within 440 yards of the shore from Bete Grise Bay to the point. Between Keweenaw Point and Gull Rock Light there is a deep passage $1\frac{1}{2}$ miles wide.

Monitor Island, with its west end about $2\frac{1}{2}$ miles to the eastward of Keweenaw Point, extends thence 3 miles to the east and is about $1\frac{1}{2}$ miles in maximum width. From its shores rocky flats extend off from 440 to 880 yards.

Light.—A flashing white light, 81 feet above water, visible 17 miles, is shown from a white, square, pyramidal tower attached to a dwelling on the east point of Manitou Island.

Fog signal.—The fog signal is made on a siren.

Gull Rock lies between Keweenaw Point and Manitou Island and is connected with the latter by a shoal bank. A dangerous gravelly shoal with 12 feet least depth lies 1,540 yards nearly south from Gull Rock Light. A pinnacle of ledge rock lies on a short narrow ridge $1\frac{1}{2}$ miles south of Gull Rock Light. The ridge has an average depth of 32 feet, and the small pinnacle is covered by but 24 feet of water. As the ridge is of dark colored rock and small in extent, being only 30 feet by 100 feet in size, the shoal is not visible under any conditions of light and water. It might constitute a menace to large vessels in stormy weather.

Light.—A flashing red light, 50 feet above water, visible 10 miles, is shown from a yellow square brick tower on a dwelling on Gull Rock.

This light is a guide through the passage between Keweenaw Point and Gull Rock.

Buoy.—A red spar buoy marks the westerly side of the shoal lying 1,540 yards south of the light.

Copper Harbor is situated at the most northerly part of Keweenaw Peninsula, about 7 miles westward of Keweenaw Point. It is a snug landlocked harbor 3 miles long and of 565 yards average width. Around Keweenaw Point great storms come from the northeast and northwest, and against these the harbor affords ample protection, not only from the waves but from the wind.

Copper Harbor Light, flashing white, 65 feet above water, visible 15 miles, is shown from a yellow square, brick tower on a dwelling on the east point of the entrance to the harbor.

Range lights—Front light.—A fixed white light, 22 feet above water, visible 10 miles, is shown from a white wooden tower located on the south shore of the harbor.

Rear light.—A fixed white light, 39 feet above water, visible 10 miles, is shown from a white lantern on a dwelling located 157 yards 190° (S. $\frac{3}{4}$ W.) from the front light.

These in range lead through the harbor entrance.

Depths.—The water is generally deep, with good holding ground at the west end, there being an area of about 320 acres with more than 18 feet depth. There is also 18 feet depth at the entrance for a width of 280 feet, of which 190 feet lies east and 90 feet lies west of the range, the deeper water lying to the east of the range. Vessels keeping 50 or 100 feet to the east of the range will have 19 feet or more depth at low water.

Rock ledge.—A small outcropping ledge of rock, 8 or 10 feet wide, 20 feet long, and with a least depth of 17 feet at low-water datum, lies 125 yards 49° (NE. $\frac{1}{4}$ E.) from the northeast corner of the Booth Wharf. The surrounding depth is not less than 20 feet.

Wharves.—On the south shore of the harbor, about 1,320 yards west of the range lights, is the merchandise wharf of the Booth Fisheries Co. It is in such an advanced stage of decay as to be no longer serviceable. At the face of this wharf there is 12 feet of water at the east corner and from 13 to 16 feet farther west. Vessels seeking shelter in northeast storms should go to anchor near the west end of Porter Island, where the best holding ground in the harbor is to be found. (Information of January, 1917.)

Directions.—To enter, run in on the range, bearing 190° (S. $\frac{3}{4}$ W.) until the harbor light bears due east, when change course to due south for about 440 yards (to about 200 yards past the rocks which show on the west side of the entrance), and then steer due west for the wharves.

Agate Harbor is on the northerly face of Keweenaw Peninsula, about 9 miles west of Copper Harbor and about 5 miles east of Eagle Harbor. The coast between is bold and steep-to. The harbor consists of a North and South Harbor parallel to each other and open to the westward, inclosed by two narrow peninsulas which extend westward from the mainland, and by islets and shoals which extend still farther westward from the ends of the peninsulas. These harbors afford safe shelter and good holding ground for small craft. Care should be exercised to avoid shoals.

North Harbor.—To enter, bring the target or beacon on the main shore (about 880 yards east of the large warehouse) to bear 156° (SSE. $\frac{1}{4}$ E.), run in on this course till the houses on the south shore

of the South Harbor come in range with Agate Point (the extremity of the dividing peninsula between the two harbors), then haul up 87° (E. $\frac{3}{4}$ N.) to the anchorage in the middle of the harbor. The maximum available depth across the outer line of shoals at the entrance is 19 feet.

South Harbor.—To enter, head in as above for the target, but continue on until the small rocky island west of Agate Point is just opened with the north side of the point, when haul up for the houses on the north side of South Harbor and run for them until abreast of Agate Point, and then steer for the wharf on the south side or for the anchorage in the middle of the harbor.

Eagle Harbor, is a partly inclosed indentation in the north face of Keweenaw Peninsula about 5 miles to the westward of Agate Harbor. The coast between the two harbors is bordered by shoal water and rocks extending 440 to 1,100 yards offshore.

In shape it closely resembles a rectangle, in which the length trending with the shore measures about 1,633 yards and the width about 383 yards. The area of possible anchorage ground, having a depth of 14 to 22 feet, is 33 acres. The general character of the bottom within this area does not give the best holding ground. The shores in the vicinity are rocky and bold and dangerous to approach during northerly gales. Outside of the entrance, at a distance of 333 yards therefrom, there is a reef upon which a minimum depth of 2 feet is found. Vessels do not enter Eagle Harbor or remain there when a storm is imminent.

Caution.—Some pieces of riprap lie on the steamer track midway between the cribs, having a depth over them of 11 to 12 feet. Some pieces of riprap about 20 feet from the west crib have only 9 to 10 feet of water over them, and this crib should be given a berth of about 25 feet.

Channel.—Latest advices indicate that the channel entering this harbor, has a limiting depth of $11\frac{1}{2}$ feet at one point. At the wharf there was scarcely 11 feet.

Caution.—Boats drawing over 12 feet should not enter the harbor.

Light.—A fixed and flashing white light, 60 feet above water, visible 15 miles, is shown from a red octagonal brick tower on a dwelling on the north point of Eagle Harbor.

Fog signal.—The fog signal is made on a steam whistle.

Coast Guard station is located on the harbor side of the east point of the harbor.

Storm warnings.—Day and night signals are displayed from a steel tower located 200 feet northwesterly from the harbor light.

Radio compass station.—A radio compass station is under construction.

Eagle River lies on the northwesterly face of Keweenaw Peninsula, about 8 miles southwestward of Eagle Harbor. The coast between is a succession of dangerous reefs and outlying rocks extending 440 yards to 1 mile offshore and parallel to it. It is unimportant as a commercial port and practically abandoned; it has a pier in decaying condition and the channel is filling up.

Wreck.—A portion of a wreck lies in a depth of 32 feet or more on a rock bottom $1\frac{1}{4}$ miles due west of the mouth of Eagle River. It is entirely submerged and a menace to navigation. While well out of the course of large vessels, the locality should be avoided by coasting vessels.

Sand Hills Light, flashing white, 91 feet above water, visible 18 miles, is shown from a buff-brick, square tower on a two-story dwelling on a point $3\frac{3}{8}$ miles southwest of Eagle River.

Fog signal.—The fog signal is made on a diaphone.

The coast from Eagle River to Sand Hills Light has no dangers farther offshore than 440 yards, except for one detached shoal with a least depth of 14 feet lying about $1\frac{3}{8}$ miles 42° (NE. $\frac{3}{8}$ N.) from Sand Hills Lighthouse.

Hutchinson Shoal, having a least depth of 13 feet lies $1\frac{3}{8}$ miles 254° (WSW. $\frac{1}{2}$ W.) from Sand Hills Lighthouse.

Coast.—From Sand Hills Light the coast trends southwesterly for about 17 miles to the upper or western entrance of the Keweenaw Waterway. This part of the coast is free of danger outside the 880-yard limit, except for Hutchinson Shoal (previously described) and a spit about 1,100 yards wide, and extending offshore 1 mile in northerly direction from a point just northward of the Keweenaw Waterway Entrance.

Keweenaw Waterway.—This waterway, formerly designated the Portage Lake and Lake Superior Canals, is about 25 miles in length, crossing Keweenaw Peninsula from Keweenaw Bay on the southeast side to the open lake on the northwest side, including 5 miles in Portage River and its dredged cuts, $17\frac{1}{2}$ miles in Portage Lake, and $2\frac{1}{4}$ miles in the upper canal from the head of Portage Lake to Lake Superior, excavated through what was formerly dry land at the northerly end of the route. It was constructed for the purpose of affording a through route for vessels bound up and down the lake, with refuge from storms, and of developing the commerce and business of the rich mining territory adjacent to Portage Lake.

General conditions.—There is a depth of 20 feet for a bottom width of 120 feet or more throughout the waterway, the two entrances are well protected by breakwaters and piers, the channel banks are revetted where necessary to prevent wash from passing vessels, and mooring facilities are provided at Lily Pond, near the upper entrance, and in the harbor of refuge inside of Portage Entry.

Upper entrance.—The two breakwaters at this entrance start at the shore line at points about 1,000 yards apart and extend out at right angles to the general direction of the shore for about 267 yards; each then deflects 45° toward the other and extends about 633 yards into a depth of 31 feet, where an opening of 133 yards is left between their outer ends in front of the canal and 667 yards from shore. The partially sheltered area of 106 acres inclosed by the breakwaters has a depth varying from shallow water near shore to 31 feet at the entrance; about 39 acres of this area has a depth of at least 18 feet and affords anchorage with fair shelter. Vessels are not allowed to tie up to the piers; the nearest moorings are at Lily Pond, 1 mile down the canal, where there is complete shelter.

At the canal entrance, inside of the breakwater piers, two timber piers extend out at right angles to the general direction of the shore line. The east pier has a length of about 200 yards, beginning at the shore line; the west pier has a total length of about 350 yards extending about 267 yards outside of the shore line. The clear distance between the piers at the outer end is 80 yards; farther in it widens to about 100 yards, and at the inner end it narrows to 50 yards, which is the width of the main channel of the canal between the revetments.

There is a channel 117 yards wide and 23 feet deep from the outer ends of the breakwater piers to within about 200 feet of the old piers. Thence the regular channel, 120 feet wide and 20 feet deep, leads to the harbor of Lily Pond and to Portage Lake. This channel is lined with timber revetments for the greater part of its length.

Lights.—A flashing white light, 32 feet above water, visible 8 miles, is shown from a white square pyramidal tower on the outer end of the east breakwater.

An occulting red light, 32 feet above water, visible 7 miles, is shown from a white square tower on the outer end of the west breakwater.

A fixed red light, 39 feet above water, visible 6 miles, is shown from a white square wooden tower on the shore near the inner end of the pier.

Fog signal.—The fog signal is made on a steam whistle.

Note.—The waterway is well lighted and marked from terminal to terminal. For a complete description of the navigational aids, mariners are referred to the chart and light list.

Houghton and Hancock are two important towns located, respectively, on the south and north sides of the waterway, 10 miles distant from the upper entrance and 15 miles from the lower entrance. They are both provided with numerous wharves having deep water alongside.

Engineer branch office.—An office is maintained at Houghton, on Shelden Street near the northeast corner of Shelden and Isle Royal

Streets, upstairs, which is the headquarters of the overseer of the waterway. Here detailed charts of the waterway may be seen and other information obtained. Vessel record blanks for reports of cargoes are to be had upon application, as well as copies of rules and regulations for the waterway. This office has telephone connection with the watchman's house near Portage Entry, with the watchman's house at Lily Pond anchorage basin, and with the Coast Guard station at the upper entrance.

Coast Guard station is situated near the lake shore on the easterly side of the northerly end of the upper canal.

Storm warnings.—At the upper entrance, day and night signals are displayed from a steel tower about 100 feet south of the Coast Guard station and may be seen from Lily Pond. Weather reports are received at the United States watchman's house near Lily Pond.

At Houghton, day and night signals are displayed from a steel tower on the new Masonic Temple, corner of Shelden and Portage Streets.

At Portage Entry, day and night signals are displayed from a steel tower near the United States watchman's residence.

A radio station at Calumet is operated all the year by the United States Navy; after close of navigation station is not open from 8 p. m. to 8 a. m.; call letters NUG; working distance 150 miles.

Lily Pond is an enlargement of the canal, situated about 1 mile from the lake, and, as improved, makes an excellent harbor in which vessels can lie at all times with safety. It is 1,150 yards long, 200 yards wide along its middle portion, has an area of 36 acres with a depth of 20 to 23 feet throughout, a frontage of $1\frac{1}{2}$ miles, finished with pile-pier revetment, with timberwork 4 feet above water, decked over, and provided with mooring posts at intervals of 48 feet, where vessels can conveniently tie up either singly or several abreast.

Portage Lake, into which the upper canal enters, is $17\frac{1}{2}$ miles long, generally narrow and resembling a river, but without sensible current. It has a least depth of 20 feet along the vessel course. The general depth of the lake is much greater. All shoal points are so well marked by buoys and so many points are marked by lights that there should be no trouble in passing through. At the head of Portage Lake there is a channel 145 feet wide and 20 to 24 feet deep along the first range on coming down from the canal. A flat scow, 80 feet by 20 feet in size and 5 feet deep, was sunk in June, 1919, alongside and overlapping the corners of the Croze coal dock and Pryor lumber wharf at Houghton. The scow is an obstruction for boats drawing over 9 feet of water, landing at these wharves. The middle ground south of Grosse Pointe, where the depth is only 11 feet, is marked at its extreme southeast end by a red and black horizontally striped can

buoy. Vessels entering Torch Bay from Portage Lake should pass to southward of this buoy.

Bridge.—There is but one bridge over the waterway, a combined highway and railway bridge, crossing Portage Lake and connecting the cities of Houghton and Hancock. The draw span is 288 feet long, carrying the railroad below and the highway and street railway above. The two arms of the draw span are of equal length, but the channel openings are slightly unequal in width—the south opening is 118 feet and the north 107 feet in the clear. The height of the lowest part above high water is $5\frac{1}{2}$ feet.

The channel at the south draw opening has a clear width of 118 feet and a depth of 25 feet for the entire width, and is free from obstruction. In the north channel there is a depth of 20 feet or more for 100 feet width, the deep water running close to the center pier and to within 7 feet of the old timber wharf projecting into the channel from the north side.

Signal.—The signal for opening the draw is 1 long, 2 short blasts (— — —).

Pike Bay.—There is an available channel with depth of 14 feet or more at ordinary stages during the navigation season, leading up to the lumber wharf at Chassell, on Pike Bay, at the southwesterly end of Portage Lake. The channel is about 100 feet wide and is marked by private buoys. The west edge of the deep water is on the line of the face or east side of the lumber wharf (which is 400 yards long), so that by keeping the face of the wharf open a little it will make a good range for running the channel.

Torch Lake and Canal are tributary to and lie northeasterly from Portage Lake. Torch Lake is $5\frac{3}{4}$ miles long and $1\frac{3}{4}$ miles in greatest width, with a maximum depth of 155 feet. On the northwesterly shore of the lake are the towns of Lake Linden and Hubbell, with extensive stamp mills and copper-smelting works. Good wharves are provided.

The canal is well marked. There is a fixed white light on the east side of the south end; at the north end there is a fixed white light on the west side and a fixed red light on the east side. There are five pairs of range lights, the front lights white and the rear lights red, all situated on the east bank. There are also two fixed white lights on the west bank. The channel is also marked by buoys distributed along it, placed in conformity with Government regulations. Vessels bound for Torch Lake leave red buoys to starboard and black buoys to port. The canal being a private one, the marks are not maintained by the Government.

Portage River is the natural outlet of Portage Lake and forms part of the waterway across Keweenaw Peninsula. The distance

from Portage Lake to the outer end of the pier in Keweenaw Bay, by way of the dredged cuts, is about $5\frac{1}{2}$ miles. Dredging by the Government has straightened, deepened, and greatly improved the channel, and has given increased width at bends to enable vessels to make the turns with greater ease and safety. Caving banks of dredged cuts have been protected by timber revetments. This part of the waterway has a least width of 120 feet and a controlling depth of 20 feet.

There are pile clusters on the banks of Portage River at Princess Point to aid vessels in getting off the bottom, which was sometimes struck while making the short turn in the river at that place. Four of these clusters, spaced 300 feet apart, are on the shore of Princess Point, and four of them on the opposite shore of the river. Each cluster consists of three piles, one of which stands higher than the others. Lines can be run to these piles for pulling the vessels off.

Portage River harbor of refuge comprises a basin 880 yards long, 800 feet wide, and 20 feet or more in depth, with a mooring pier 667 yards long on the west side. This provides a harbor where vessels may seek refuge from storms and where eastbound boats may lie to and await clearing weather before passing into the open lake, the location being sufficiently near the mouth of the river to permit masters of vessels moored at the pier to observe weather conditions outside.

Note.—On the vessel course between Sault Ste. Marie and Duluth, no distance is saved by taking this waterway; on the contrary, the distance by the canal is about 5 miles greater. However, between Marquette and Duluth there is a saving of about 22 miles, and between Marquette and Ashland a saving of about 26 miles, by the canal as compared with the route outside of Keweenaw Point. The use of the waterway for refuge is indicated by the fact that more freight passes through the canals in October and November, the stormy season, than at any other time in the year, although the commerce on Lake Superior, as shown by the records at the Sault and at the head of the lake, is heaviest during July and August.

Directions.—The chart and the instructions of the canal superintendent, who has control of all traffic, are the best directions.

Regulations.—Masters of vessels should provide themselves with a copy of the latest rules and regulations governing the use of the canal. They may be obtained from the superintendent of the canal.

Coast.—From Keweenaw Waterway, the coast trends southward for about 28 miles, is free from off-lying dangers, and can be approached to within 880 yards. There are no safe harbors on this stretch of the coast.

Fourteen-Mile Point.—At Fourteen-Mile Point a bank with 14 feet near the outer edge extends northward for 1,100 yards.

Light.—A fixed white light with a red flash, 60 feet above water, visible 15 miles, is shown from a red square brick tower on Fourteen Mile Point.

Fog signal.—The fog signal is made on a steam whistle.

Ontonagon Harbor.—This harbor, formed by the mouth of Ontonagon River, is situated near the middle of a long stretch of exposed coast, about 41 miles from the artificial harbor at the Portage Lake Canal, the nearest shelter to the east, and about 55 miles from the Apostle Islands to the west. It is therefore of importance as a harbor of refuge for coasting vessels.

Harbor and piers.—The east pier is 772 yards and the west pier 892 yards long. The shore line is variable on account of shifting sand. The piers bear about northwest by north and are 78 yards apart at the outer ends and 79 yards apart at the inner ends. There is some riprap at the base of each pier.

Extensive shoaling occurs in the harbor about the time of opening of navigation in the spring, caused by deposits of sediment brought down by the river. These shoals are removed, in whole or in part, by the Government as soon as practicable after their occurrence, and by private dredging in the immediate vicinity of the wharves.

No harbor lines exist and no special rules and regulations are in force.

Channel.—At present in the harbor entrance and channels there is shoaling on the bar in the lake approach and in the channel, though it extends from deep water in the lake at a distance of 217 yards north of the end of the west pier in to a point 83 yards north of the end of that pier. The dredged channel in the lake approach is about 80 feet wide with a least depth of 15 feet. Very shoal water exists on the bar outside of the dredged channel.

The channel along the west side, between the piers, is about 80 feet wide and 15 feet deep to within 133 yards of the inner end of the west pier. Then the channel leading to the lumber wharf on the east side of the harbor and along the face of that wharf is from 50 to 70 feet wide and 12 feet deep.

Directions.—Tugs and small craft drawing 12 feet of water can enter the harbor by following a range 60 feet east of the line of the west pier from the lake to a point 133 yards north of the inner end of the west pier, then swinging onto a range parallel to and 30 feet away from the face of the lumber wharf on the east side.

Light.—A fixed red light, 31 feet above water, visible 11 miles, is shown from a white square tower on the outer end of the west pier at Ontonagon Harbor.

Fog signal.—The fog signal is made on a hand horn, which answers vessels' signals.

Ontonagon Light, fixed white, 44 feet above water, visible 13 miles, is shown from a yellow brick tower on the west bank of the Ontonagon River.

These lights form a range to guide to the harbor entrance, but must be kept open to the westward in entering.

Bridges.—A highway bridge crosses Ontonagon River about 300 yards above the inner ends of the piers. There is a draw span over the main channel, with two openings, each having a clear width of 38 feet and a clear height of about 6 feet. No lights are exhibited on the bridge. There are no special regulations. The signal for opening the draw is four whistles (— — — —).

About 730 yards above the highway bridge a railroad bridge, with-out a draw span, crosses the river, having three main spans, each 108 feet long and 9 feet in clear height above low-water datum.

Storm signals.—Day signals are displayed from a 30-foot pole about 75 feet east of Ontonagon Lighthouse.

Coast.—From Ontonagon to Chequamegon Point, a distance of about 79 miles, the coast is free from outlying dangers. The shores are steep-to and can be approached to within 440 yards.

There are no safe harbors or landings between these points except Union Bay, 15 miles west of Ontonagon, which affords shelter from southwest winds.

Chequamegon Bay is about 12 miles long by 5 miles in width at a point midway of its length, and is inclosed from Lake Superior by a narrow and wooded sandy formation consisting of Chequamegon Point and a detached strip in its prolongation, designated Long Island.

The east shore of Chequamegon Bay is covered by an extensive flat, the 18-foot curve extending 3 miles in a southerly direction from Chequamegon Point Light, then curving westerly to a point $4\frac{1}{2}$ miles west of Oak Point and approaching to within 1,540 yards of the west shore at Washburn; it then takes a southerly turn toward the end of the breakwater at Ashland. A shoal composed of hard bowlders, with least depth of $8\frac{1}{2}$ feet, lies near the middle of Chequamegon Bay, about 3 miles east of Washburn and about halfway between that place and Oak Point. It is outside of the main channel and can readily be avoided by the small craft which are able to navigate in the adjacent shallow water, where the available depth is 11 feet.

The head of the bay is covered by flats extending along the west shore to within $1\frac{1}{2}$ miles of Washburn. There is a shoal extending 500 yards in a north-northeast and south-southwest direction, with least depth of 18 feet, its southerly end lying 1 mile northeast by east from the warehouse at Washburn and 500 yards offshore. Houghton Point may be safely cleared with a berth of 333 yards, and then to

Bayfield the shoal border is 440 to 660 yards wide, with no outlying obstruction.

Chequamegon Point Light, fixed red, 39 feet above water, visible 10 miles, is shown from a white square pyramidal tower on the western end of Long Island.

Fog signal.—The fog signal is made on a bell.

La Pointe Light, fixed white, 70 feet above water, visible 16 miles, is shown from a white square tower on the northern side of Long Island.

Fog signal.—The fog signal is made on a steam whistle.

Light buoy.—A black conical buoy, showing an occulting white light, is moored in 30 feet on the edge of the shoal extending from the east shore of the bay.

Ashland Harbor is near the head of Chequamegon Bay, which is sheltered from the storms of Lake Superior by Chequamegon Point and Long Island and by the Apostle Islands. The size of the bay, however, permits the generation within itself of waves, which in northeast storms are augmented by the swell coming in from the lake. The natural depth at the entrance and through the bay up to the vicinity of the city is ample, and there is a depth of at least 19 feet up to the ore docks and along a considerable portion of the harbor lines; but in proceeding to the southwest shoaler water is found, requiring dredging for the accommodation of large vessels.

Harbor lines are established along the water front, but no special rules or regulations are in force.

The breakwater terminating in a pierhead crib is $1\frac{1}{4}$ miles long beginning at a point about 665 yards from shore near the harbor line and bears in a general northwest by north direction. It lies about 2 miles from the center of the business part of the harbor and affords more or less complete protection to the wharves and shipping from the waves generated by the northeast storms.

Light.—An occulting white light, 65 feet above water, visible 16 miles, is shown from a gray octagonal pyramidal tower on the breakwater pierhead.

Fog signal.—The fog signal is made on a siren.

Channel.—The dredged channel extending from near Ellis Avenue and Commercial Wharf in a southwesterly direction to a little past the prolongation of Seventeenth Street is about 1.2 miles long, 67 yards wide, and has a depth of 19 feet. Opposite Beaser Avenue there is a turn in the channel, so that the westerly 633 yards has a more westerly direction than the easterly portion.

Over the natural bottom of the bay to the northeastward of the Commercial Wharf there are depths of about 17 to 18 feet along the harbor line in front of the ore docks, with greater depths farther

out in the bay. The approaches to the ore docks have a depth of about 20 feet. The entrance to the channel is 1,000 yards to southwestward of the nearest ore dock and is not used by vessels carrying iron ore.

Buoys.—The dredged channel just outside of the harbor line is marked on the southeastern side by four black spar buoys and one red spar buoy. It is marked on the northwestern side by five red spar buoys.

Docks—Chicago & Northwestern Railroad ore docks 1 and 2 extend out to the harbor line, with a depth of 19 feet on both sides of each dock for 600 yards in from the outer end. Dock No. 3, to the northeast of No. 2, is about 480 yards long, its outer end being about 288 yards in from the harbor line, with a depth of 19 feet on the eastern side. There is a dredged circular basin having a radius of 166 yards in every direction from the outer end of this dock, with an entrance channel 150 yards wide at the harbor line and flaring broadly into the basin. The least depth in the approach to these docks is 18½ feet, located 275 yards outside of the harbor line and on a line 25 feet east of the prolonged center line of Dock No. 3. Generally there is a depth of 20 feet or more in the approach.

Reiss coal dock, located near the base of above ore docks and reached through a slip on the west side of Dock No. 1, 233 yards long. There is 19 feet of water along the entire front of this wharf.

Clarkson coal dock.—There is a depth of 19 feet along the west side of the wharf for 200 yards from the outer end 14 feet for a further distance of 200 feet. The best water is nearest the face of the wharf, the 19-foot water being narrow in places.

Minneapolis, St. Paul & Sault Ste. Marie Railroad ore docks.—Dock No. 1 is 636 yards long. Dock No. 2 is 300 yards long and located 88 yards westerly from Dock No. 1. The space between the docks and a slip on the outside of each have a depth of 20 feet or more. The channel leading in from deep water in the bay has a depth of 19 feet or more and is on a line with Dock No. 1 until within 150 yards of the end of that dock, where it is widened on the westerly side to allow boats access to both sides of Dock No. 2.

Commercial Wharf.—On the east side there was 20 feet along-side for 150 yards in from the outer end and 18 feet for 100 yards farther. The approach from the Government channel, 267 yards long, had a least depth of 19 feet, though for the most part more than 20 feet.

On the west side, used for miscellaneous and passenger business, there is 16 feet alongside for 283 yards from the outer end and 15 feet for the next 133 yards. There was 16 feet on the prolongation of the west face of the wharf out to the harbor line.

Pittsburgh & Ashland Coal & Dock Co.—Formerly known as the Cooperative Coal Dock, constructed on the site of the old Keystone Lumber Co. The approach from the dredged channel is 600 yards long and 19 feet deep.

Ashland Light & Power Co. Wharf (Ohio coal dock).—The approach from the dredged channel, 83 yards long, is about 14 feet deep, and the slip had the same depth for 467 yards alongside the wharf.

Charcoal Iron Co. of America.—The entrance from the dredged channel, a distance of 200 yards, has $13\frac{1}{2}$ feet available. The depth is 17 feet alongside the wharf for 267 yards from the outer end and 14 to 16 feet for 200 feet farther in.

Storm warnings.—At Ashland day and night signals are displayed from a steel tower on the bay front at the foot of Second Avenue west, near the intersection with Front Street.

Washburn, on the west side of Chequamegon Bay, $4\frac{1}{2}$ miles north of Ashland, is an important shipping point for lumber and coal. There is good water alongside the Chicago, St. Paul, Minneapolis & Omaha Railway wharves. The two wharves are connected by an inner coal dock. From 11 to 17 feet of water will be found along the ends of the lumber wharves.

Storm signals.—Day and night storm signals are shown from a steel tower on First Avenue East near the Chicago, Minneapolis, and Omaha depot.

Bayfield is 15 miles northerly of Ashland and the coast between is clear of outlying obstructions, except for the Apostle Islands (described later). The city wharf, at the foot of Rittenhouse Avenue, has 11 or 12 feet depth of water at its end, permitting the landing of light-draft boats only. Two electric lights are displayed, one at the end and one about the middle of the wharf, at an elevation of about 12 feet above the water.

There is good water both at Booth's Wharf and at the railway wharf. Between the lumber and the Bayfield Transfer Railroad Wharves the waterworks intake pipe runs 300 yards offshore with 18 feet of water over it. In heavy northeast winds vessels run into Pike's Slip for shelter.

Storm signals.—Storm signals are shown from a steel tower at the foot of Rittenhouse Avenue, directly west of the inner end of the city dock.

Coast.—Between Bayfield and Point Detour, about 14 miles northerly, the shore is generally bold and may be approached within 440 yards. Off Roys Point, about $2\frac{1}{2}$ miles from Bayfield, shoal water with a depth of 14 feet or less extends in an east-northeasterly direction for 433 yards; this shoal should be carefully avoided in approach-

ing or leaving the local wharf. The hull of a wooden tug lies 100 feet from the north shore of Red Cliff Bay, under Red Cliff Point. Around Point Detour to within 1 mile east of Sand River the shore can be approached within 440 yards, but not more than 7 or 8 feet draft can be carried across the shoal connecting Sand Island and the mainland in the vicinity of Sand River.

Red Cliff is about 3 miles from Bayfield and 20 miles north of Ashland. The piles of a wharf still remain.

Apostle Islands.—There are good passages generally around and between the islands of this group, and five lighthouses are distributed at convenient points on the outlying islands.

Madeline Island, the most southerly and largest of the group, is 12 miles long from southwest to northeast and 1 to $3\frac{1}{4}$ miles in width. From the southwest end a sandy flat with generally less than 6 feet of water over it extends 1,320 yards in a west-southwest direction. The south shore from this place to Big Bay, and including the area around the point on the south side of the bay, has shoal water extending out from 220 to 880 yards. The sand beach on the west side of the bay may be approached with safety to within 200 yards. The shore may be approached to within 440 yards from Big Bay to the most easterly point of the island, where shoal water makes out to the south, east, and north for 1,540 yards. From the east point along the northerly and westerly shores down to Point de Froid the coast is generally bold and may be approached to within 440 yards. Off Point de Froid a sandy spit with least depth of 14 feet at the outer end extends about 630 yards in a west by north direction. From Point de Froid to the southwest end of the island shoal water extends 440 yards offshore.

Buoys.—A red spar buoy marks the outer end of the shoal extending from the southwestern end of the island.

La Point is a small old settlement and summer resort near Point de Froid at the westerly end of Madeline Island, with no commerce. Two wharves in fair condition, the La Point Wharf and the Mission Wharf, are situated about 1,330 yards apart. Each wharf extends to a depth of 8 or 9 feet and has a rock-filled crib at the outer end and a pile trestle and walk connecting with the shore.

Basswood and Hermit Islands are small, lying about 2 miles northwesterly from Madeline Island and easterly from the mainland in the vicinity of Red Cliff. The shores of both islands are bold and may be approached within 300 yards or less. There is a wharf on the southeasterly side of Basswood Island, with 11 feet of water alongside.

Stockton Island (Presque Isle), about $2\frac{1}{2}$ miles north of the northeasterly end of Madeline Island, is $7\frac{1}{2}$ miles long northeast and

southwest and about $2\frac{1}{4}$ miles in general width, with Presque Isle Point projecting about $1\frac{1}{4}$ miles from the southerly shore. The shoal area extends out 600 feet along the westerly side of Presque Isle Point; then to the westward along the south shore it decreases to 100 yards near the westerly end of the island. Around the west end the shore may be approached to within 200 yards and along the northerly and easterly sides to within 667 yards. Booth's Wharf, on the west side of Presque Isle Point, has less than 7 feet of water.

Michigan Island.—Michigan Island is on the easterly side of the group, about 3 miles northeast of Madeline Island. At the southern end of Michigan Island shallow water extends 1,320 yards southerly from the shore, with depth of but 12 feet at 880 yards out and only 16 feet at 1,100 yards out. The shoal border along the remainder of the southerly shore and that along the entire northerly shore is from 440 to 880 yards wide. From the northeast point of the island a rocky ledge reaches $1\frac{3}{8}$ miles to the northeastward.

Light.—A fixed white light, 112 feet above water, visible 19 miles, is shown from a white conical tower with a dwelling attached on the southern end of Michigan Island.

Vessels passing to the south of Michigan Island should give this light a berth of 1 mile.

Gull Island lies about 880 yards northeastward from the northeastern point of Michigan Island on the rocky ledge extending from it. It is very small and connected with Michigan Island by continuous stony patches having very scant depths.

Gull Island Shoal is a detached rocky spot with least depth of 17 feet, lying $3\frac{3}{8}$ miles 42° (NE. $\frac{5}{8}$ N.) from Gull Island, and nearly due south of the extreme east side of Outer Island. This shoal is not marked and should be carefully avoided.

Outer Island, the most northeasterly one of the group, extends about 6 miles north and south and averages about $2\frac{1}{2}$ miles in width, but has a sharp point at its southwesterly termination. Along the southeasterly face of the island a shelving rocky bank extends off an average distance of 880 yards, narrowing to 220 yards along the easterly shore. From the northeast point shoal water extends 880 yards in a northeasterly direction. Shoal water extends 1,100 yards off the northwesterly shore, diminishing in extent to about 590 yards proceeding southward along the west face of the island.

Light.—A flashing white light, 130 feet above water, visible 20 miles, is shown from a white conical tower with a dwelling attached on the north point of Outer Island.

Fog signal.—The fog signal is made on a steam whistle.

Outer Island Shoal is an unmarked menace to be avoided by vessels passing close along the north side of the Apostle Island

Group. The shoal is practically an extension of the offshore bank, with its outer edge $1\frac{1}{2}$ miles northerly from the shore at Outer Island Light, and has depths of 15 to 17 feet over rock.

Wreck.—A wooden schooner, resting on an even keel and heading about east-northeast, lies in about 52 feet of water $1\frac{1}{2}$ miles 57° (NE. $\frac{3}{4}$ E.) from Outer Island Light, and 1,415 yards 16° (N. by E. $\frac{1}{4}$ E.) from the northeast corner of Outer Island. The least depth found over her is about 25 feet.

Cat Island is 4 miles west of Outer Island and $2\frac{1}{2}$ miles north of Stockton Island. The shelving bank extends out from 660 to 880 yards around the whole north end of the island; farther south it decreases to 220 yards or less on both the east and west sides, increasing again around the south end, from which a shoal extends southward 880 yards.

North Twin Island lies on the northerly edge of the group about 6 miles west of Outer Island. Off the southerly end shoal water extends 880 yards in a southwesterly direction. The easterly shore may be approached within 440 yards and the northerly and westerly shores within 440 to 660 yards.

Rocky and South Twin Islands are about $2\frac{1}{2}$ miles to the southwestward of North Twin. At their northerly ends a rocky flat with maximum available depth of 10 feet connects the two islands, and shoal water extends 590 yards off the southerly points of both. The west shore of Rocky Island may be approached within 335 yards, and the northerly shore within 590 yards except at the northeast point, where a bank reaches $1\frac{1}{2}$ miles in a north-northeast direction from the extremity of the narrow peninsula extending $1\frac{1}{2}$ miles from the main body of the island. Off the east shore of South Twin Island shoal water is found from 660 to 1,100 yards out. In the bay formed by these islands the shores may be approached within 300 yards as far north as the small point of land on South Twin Island; this bay affords anchorage in mud and is sheltered from west and northwest winds.

Ironwood and Otter Islands are near the center of the island group. Vessels should not approach the easterly or northeasterly shores of either island or the southerly shore of Ironwood Island nearer than 590 yards; the other shores of both islands should be given a berth of 335 yards. Oak Island Shoal is 1 mile to the southwestward of Otter Island.

Manitou Island, to the southward of the preceding, is $1\frac{1}{2}$ miles northwest of Stockton Island and the same distance northeast of Oak Island. The shores may be approached within 400 yards, except off the extreme westerly point, where a shoal about 765 yards in width extends 1,100 yards in a northwest direction. Near the outer end of

this shoal is a small rocky islet, called Little Manitou Island, with very shallow water for some distance inside it.

Oak Island, lying about $1\frac{1}{2}$ miles northeasterly off the mainland above Red Cliff Point, is very bold and its shores may be approached to within 365 yards along the east and north faces and to within 567 yards along the west and south sides.

Oak Island Shoal, with minimum depth of $17\frac{1}{2}$ feet, lies 1,540 yards 25° (N. by E. $\frac{1}{4}$ E.), from the most northerly point of Oak Island, the deep-water channel between the two being 1,100 yards wide, and that between the shoal and Otter Island being over 1,540 yards wide.

Raspberry Island is about 2 miles northwest of Oak Island and $1\frac{1}{2}$ miles northeast of the mainland at Point Detour. Shoal water extends from 220 to 660 yards from shore, the maximum extent being on the south side and contiguous to the southerly vessel passage through the island group.

Light.—A fixed and flashing white light, 77 feet above water, visible fixed 13 miles flashing 16 miles, is shown from a white square tower on a dwelling on the southwest point of Raspberry Island.

Fog signal.—The fog signal is made on a steam whistle.

Buoy.—Marina Shoal black spar buoy, located about 400 yards southwest by west from Raspberry Island Light, marks the westerly edge of the shoal water making out from the light.

Bear Island is $1\frac{1}{2}$ miles northeast of Raspberry Island. Shoal water makes out an average distance of 1,100 yards from the northwesterly face, 440 yards around the southerly end, and decreases to less than 335 yards on the east and west sides.

Bear Island Shoal, with $12\frac{1}{2}$ feet least depth, lies to the westward of the northerly end of Bear Island, 2 miles from the nearest point of the island, and lying $4\frac{1}{4}$ miles 350° (N. by W. $\frac{3}{4}$ W.) from Raspberry Island Light, and $5\frac{3}{8}$ miles 232° (SW. $\frac{1}{4}$ W.) from Devils Island Light. It extends 880 yards in a north and south direction, and is over 440 yards in width. York Island Shoals lie about 1,540 yards to the southwestward of this shoal.

Devils Island is the northernmost island in the westerly part of the group. Vessels may approach within 267 yards on the east and west sides and around the northerly end; the south end should be given a berth of 440 yards.

Light.—An alternating flashing red and white light, 100 feet above water, visible 18 miles, is shown from a white cylindrical tower on the north end of Devils Island.

Fog signal.—The fog signal is made on a steam whistle.

Devils Island Shoal, a detached rocky shoal with least depth of 10 feet, lies $1\frac{1}{2}$ miles 99° (E. $\frac{1}{4}$ S.), from the light, and due north of

the extreme west side of Rocky Island. There is a passage of deep water over 1 mile wide between the shoal and Devils Island.

York Island lies about 1 mile north of Point Detour on the main shore. Shoal water extends 1,100 yards off the south point, leaving a passage from 20 to 25 feet deep and 600 yards wide between the island and the main shore and passing within 200 yards of the latter. Shoal water extends 880 yards from the southwesterly shore and 660 yards from the north and east shores.

York Island Shoals are detached rocky patches with least depth of $13\frac{1}{2}$ feet, lying 660 yards about $4\frac{3}{8}$ miles 72° (ENE.) from Sand Island Light and about $3\frac{1}{4}$ miles 332° (NNW. $\frac{1}{8}$ W.) from Raspberry Island Light; the main reef extends north and south 1 mile, and is about 660 yards wide at its northerly end. There are several detached spots with from 18 to 21 feet depths lying to the east and southeast off the southerly end of the main shoal. The width of the available deep channel on the vessel course passing between the most southerly spot and the adjacent shore of York Island is about $1\frac{1}{2}$ miles. Bear Island Shoal lies about 1,540 yards to northeastward of these shoals.

Light buoy.—A black conical buoy, showing an occulting white light, is moored in 30 feet on the west side of York Island Shoals.

Sand Island is $1\frac{1}{4}$ miles north of the mainland at Sand Point. Shoal water extends from the southeasterly end of the island in a southerly direction to the mouth of Sand River on the main shore; the maximum available depth across this ridge is only 7 or 8 feet. There are two small wharves just west of the southeast point of the island; the easterly one, Shaw's wharf, has 12 feet of water at its end, and the westerly one, Fifield's wharf, about 5 feet at its end; there is about 8 feet depth approaching the wharves. Along the middle of the easterly shore shoal water extends off 1,100 yards, decreasing in extent to the north and south. The northwesterly shore must not be approached within 1,100 yards nor the westerly shore within 440 yards.

Light.—A fixed white light, 56 feet above water, visible 14 miles, is shown from a red octagonal tower on a dwelling on the north point of Sand Island.

Sand Island Shoals are detached and rocky, with least depth of 13 feet, running about $1\frac{1}{2}$ miles in a north by east and south by west direction, and being nearly 880 yards wide at the northerly end. The south end of the shoals lies about 880 yards east-northeast from the extreme easterly point of Sand Island, with a maximum depth of about 25 feet intervening, and the north end lies about $1\frac{1}{2}$ miles 63° (NE. by E. $\frac{1}{4}$ E.) from Sand Island Light.

Wreck.—The wreck of a steel steamer lies on the eastern side of Sand Island Shoals, $1\frac{3}{4}$ miles 78° (ENE. $\frac{1}{4}$ E.) from Sand Island

Light. Deeply loaded vessels should keep at least 670 yards to the north of this location. The greater part of the wreck has been removed; the remaining portions give a clear depth of 14 feet. The least depth over the rock shoal where the wreck lies is reported to be 17 feet, precluding navigation in the vicinity by large vessels, and the depth of 14 feet over the wreck is ample for coasting steamers and small craft, except possibly in a heavy sea.

Buoy.—A red spar buoy is maintained on the north side of Sand Island Shoals, to guide clear of the shoals and the wreck.

Eagle and Steamboat Islands.—Eagle Island, about $3\frac{1}{2}$ miles southwest of Sand Island and the most westerly of the Apostle group, is of small area, with shoal water extending offshore 335 yards around the west, north, and east shores. From the southerly point a shoal, decreasing from 880 to 220 yards in width, extends 1,175 yards in a south-southeasterly direction; on this shoal, about 335 yards southeast by east from the south point of Eagle Island, was formerly a small island called Steamboat Island, which is a narrow shoal of gravel and bowlders, with nothing in sight except at low water and in rough weather. The width of deep water between the southerly extremity of the shoal and the bold mainland shore opposite is $1\frac{1}{4}$ miles.

Coast.—From Sand Point southwesterly past Squaw, Siskiwit, and Bark Bays to Bark Point, about 11 miles, and then $11\frac{1}{2}$ miles to Port Wing, the coast is generally bold, and there is deep water close along the shore, with the exception of shoals extending about 1,320 yards northeasterly from Bark Point.

Cornucopia, a village situated at the head of Siskiwit Bay, 46 miles east of Duluth, has a sawmill with a capacity of about 35,000 feet of lumber per day, and shingles and lath are also manufactured. The wharf is 50 by 100 feet in size and 6 feet above the water, with $13\frac{1}{2}$ feet depth on either side, and with an approach 20 feet wide and 200 feet long. There is good shelter from west, south, and easterly winds, and some protection from northeast winds.

Bark Bay, 45 miles east of Duluth, affords good shelter except from northeast winds. There is good water to the beach and good anchorage.

Herbster is at the mouth of Cranberry River, $5\frac{1}{2}$ miles southwest of Bark Point and 41 miles east of Duluth. There is a pile wharf in the lake east of the mouth of the river, where vessels can lie in southwest winds. This wharf has a length of 360 feet out from shore, width of 16 feet, height of 8 feet above water level, and a depth of about 13 feet at the outer end.

Port Wing Harbor is about 34 miles east of Duluth and situated on Flag Lake about 1,320 yards within the entrance to Flag River. What is known as the harbor of Port Wing consists of a dredged channel 70 to 130 feet in width, extending southerly from the main

entrance about 830 yards; a long, shallow body of water of varying widths, called Flag Lake, and several shallow sloughs, all of which are separated from Lake Superior by two long narrow sand spits.

No harbor lines are established and no special rules or regulations are in force.

Piers.—The east pier is 265 yards long. The west pier has a total length of 275 yards. Each pier consists of two rows of piles, filled in with slabs and topped with large rock, and having an embankment of riprap against the rear side in the deeper water, but none in the channel. The piers bear nearly north, and the clear width between them is 200 feet. The outer ends of the piers are opposite each other.

A wing revetment pier 100 feet long runs southwest from the inner end of the west pier to prevent the sea from washing over the land at the rear of the pier and carrying sand into the channel.

Light.—A flashing white light, 30 feet above water, visible 10 miles, is shown from a black mast on the outer end of the east breakwater.

Channel.—A channel through the entrance has a controlling depth of 15 feet and requires redredging at intervals. The turning slip extends to a point 200 feet east of the inner end of the east pier, with a width of 150 feet and a depth of 15 feet.

From deep water in the lake to a point 100 feet inside the outer end of the piers the channel is 120 feet wide, with its middle 75 feet west of the east pier. Then inward between the piers the channel was 80 feet wide, with its middle 70 feet west of the east pier. The turning slip at the inner end of the east pier had a depth of about 15 feet.

In the private channel along the lumber wharf there is an available depth of 10 feet to a point 400 feet from the entrance piers, and a depth of 10 feet up to the fish wharf.

Coast from Port Wing to Superior, at the head of Lake Superior about 30 miles in a west-southwesterly direction, is free from outlying dangers and may be approached safely up to 1,320 yards.

Orienta is at the mouth of Iron or Iron Ore River, about 5 miles westerly from Port Wing and 30 miles east of Duluth.

Duluth and Superior, two cities located at the western end of Lake Superior, have a combined population of 138,541 (1920). The city of Superior is in the State of Wisconsin on the southern side of Superior Bay; the city of Duluth is in Minnesota on the north-western side of the bay. The two cities are connected by draw-bridges.

Harbor.—Duluth-Superior Harbor is the most important harbor on the Great Lakes, both on account of its facilities, natural and artificial, and the magnitude of its commerce.

This harbor is composed of Superior Bay and its tributaries—St. Louis Bay, St. Louis River, Allouez Bay, and the mouth of Nemadji River. It has an area of 19 square miles and 49 miles of available harbor frontage, but only about 6 miles of same is occupied. There are 17 miles of channels with a width varying from 100 to 600 feet, and 708.7 acres of anchorage area, all with a least depth of 20 feet and well protected from storms. The harbor has two entrance channels—Superior Entry and Duluth Ship Canal.

The average date of opening of interlake navigation at Duluth-Superior Harbor for 49 years has been April 21, and the average date of closing December 15. This is dependent on the opening of navigation at Sault Ste. Marie, Mich.

All classes of Lake vessels use this harbor. So far the largest had a length of 625 feet, beam 64 feet, and a draft of $21\frac{1}{2}$ feet. However about 80 per cent of the freight is carried in vessels of 3,000 to 6,000 net registered tonnage.

Trade.—Duluth-Superior has for many years been the second port in the United States in total tonnage handled.

The Lake commerce at this port for 1919 amounted to 42,895,681 net tons. This decrease from the preceding year was caused by labor troubles in the mines and on the docks, as the average yearly commerce for the past five years has been 48,345,194 tons.

Communication.—The following railroads serve this port: Duluth & Iron Range; Minneapolis, St. Paul & Sault Ste. Marie; Chicago, St. Paul, Minneapolis & Omaha (Chicago & North Western); Great Northern; Northern Pacific; Duluth, South Shore & Atlantic; Duluth, Winnipeg & Pacific (Canadian Northern); and Duluth, Missabe & Northern. The Chicago, Milwaukee & St. Paul Railway has trackage rights for freight over the Northern Pacific lines into this port. These railroads connect with all parts of the United States and Canada.

Manufactures.—The principal industries of Duluth are the manufacturing of steel, woolens, rugs and carpets, lumber, furniture, and cement.

Shipbuilding is extensively carried on.

Wisconsin Point, about $2\frac{1}{2}$ miles long, extends in a northwesterly direction and protects Allouez Bay, in the southeastern end of the harbor, from the storms of the Lake.

It is separated from Minnesota Point by Superior Entry Channel.

Minnesota Point is a narrow strip of land over 6 miles long, extending in a northwesterly and southeasterly direction, forming a natural breakwater protecting the harbor from the storms of the Lake.

Channels and basins.—A general description of the various channels and basins, with approximate dimensions, is given. The

20-foot depth on the sides of the channels or basins adjacent to harbor lines is generally 150 feet distant from the harbor line and parallel thereto. The principal channels and basins in Superior and St. Louis Bays are marked and lighted as described in the light lists issued by the Bureau of Lighthouses.

Soundings are taken through the ice over portions of the harbor each winter, so as to cover different channels or parts of channels where the occurrence of shoaling is suspected, and dredging is done each season as needed for the removal of shoals and for maintaining a constant navigable depth of 20 feet or more. The only locality in the harbor that is subject to serious shoaling is near the mouth of the Nemadji River.

Superior entry.—The south concrete revetment pier, and the north concrete revetment, extending in a northeasterly and southwesterly direction, are 500 feet apart and terminate nearly abreast of the Lake shore line of Wisconsin Point.

Two converging breakwaters, forming a stilling basin, extend from the shore (of Minnesota Point on the north and Wisconsin Point on the south) out to 30 feet depth, with an entrance opening 200 yards wide in line with the axis of the inner entrance and about 630 yards outside of the ends of the new piers.

Entering from the lake there is 30 feet depth for the entire width of 200 yards, except for 20 feet next to the pierheads. Within the breakwaters there is a channel 200 yards wide and 30 feet deep extending in to within 50 feet of the ends of the inner concrete revetments, with 24 feet depth entering the revetted channel. On both sides of the 200-yard entrance channel there is 24 feet depth in the stilling basin under either breakwater, the edge of deep water being 160 feet from the center lines of the breakwaters and extending in to the curving shore line.

Between the concrete revetments, which are 500 feet apart, the channel is 24 feet deep for a width of 430 feet, with the edge of deep water 35 feet from the north concrete revetment on the starboard side and, on the port side, 35 feet from the south revetment in as far as the curve at the harbor end; here the distance out from the south revetment of the 24-foot curve gradually increases to 100 feet for the inner 400 feet length of the pier. Riprap stone lies along the base of the piers on the canal side, the depth over it being 16 feet next to the south revetment, sloping into the canal, and 18 feet next to the north revetment.

Slight shoaling has occurred on the north side of the canal at the outer end, which reduces the width of 24-foot depth to 106 yards just within the entrance, gradually widening to 133 yards at 200 yards from the entrance.

The widening along the north bank of the harbor basin from the inner end of the entrance channel to and into the front channel has been completed.

There are frequent currents setting through Superior Entry, usually simultaneous with and of the same directions as those at Duluth Canal. They are, however, of less velocity than the latter, owing to the greater length of channel and the consequent small degree of slope for any difference of level between lake and harbor.

Lights.—An occulting white light, 70 feet above water, visible 16 miles, is shown from a gray tower on a cylindrical dwelling on the outer end of the south breakwater.

Fog signal.—The fog signal is made on a siren.

A group flashing white light, 70 feet above water, visible 14 miles, is shown from a black skeleton tower on the outer end of the north breakwater.

An occulting white light, 39 feet above water, is shown from a black pyramidal tower on the inner north pierhead.

An occulting red light, 39 feet above water, is shown from a red pyramidal tower on the inner south pierhead.

Superior Harbor Basin has a length of about $1\frac{1}{4}$ miles, measuring northwesterly from a point opposite the northwesterly corner of Pittsburgh Coal Dock No. 5, in Allouez Bay, to Quebec Channel, and a width of about 500 yards opposite the inner end of Superior Entry, increasing to about 730 yards at the prolongation of Dorsey Mill Wharf. It is designed for a turning basin for vessels passing between the entry and the channels leading from the basin and affords anchorage facilities.

Light.—A flashing white light, 36 feet above water, is shown from a black pyramidal tower on the inner end of the south pier.

Buoys.—The southern side of the basin is marked by 3 black spar buoys. The eastern side is marked by 3 black spar buoys. (See chart.)

Allouez Bay Channel has an expanse of 20-foot water 125 yards wide extending up to and past the slip on the east side of the Chicago, St. Paul, Minneapolis & Omaha Railway Wharf in Allouez Bay, a distance of about 715 yards.

Buoy.—A black spar buoy marks the easterly limit of deep water at the head of this channel.

Light.—A fixed white light, 12 feet above water, is shown in conjunction with a white daymark from a post on a pile cluster on the northeast side of the dredged channel.

Nemadji River is a tributary of Superior Bay. It is tortuous and has an available depth of $5\frac{1}{2}$ feet near its mouth. It is little navigated by vessels.

Duluth Harbor Basin is an anchorage basin beginning at the inner end of the harbor entrance and covering the northerly portion of Superior Bay. The basin has a total area of 446 acres with a depth of 20 feet or more and an average width of about 880 yards; its southerly limit is 983 yards south of the Peavey elevator. The least width of deep water at the junction of East Gate and Duluth Harbor basins is 500 feet.

Lights.—A fixed white light, 12 feet above water, is shown in conjunction with a white day mark from a post on a pile cluster at the north angle of the harbor basin.

A fixed white light, 12 feet above water, is shown in conjunction with a white day mark from a post on a pile cluster in 20 feet at the southeast angle of the harbor basin.

Buoys.—The northeasterly side of the harbor basin is marked by three black spar and two black can buoys. The southwestern by three red spar buoys.

East Gate Basin, with an area of about 179 acres and a depth of 20 feet or over, connects Duluth Harbor Basin with Superior Front Channel and West Gate Basin. It is about 1,320 yards long north-west and southeast and has a maximum width of a little over 880 yards.

The Duluth-Superior Railroad and highway bridge crosses the Gate at Rice and Connors Points and forms the dividing line between East and West Gate Basins.

Lights.—A fixed red light, 12 feet above water, is shown in conjunction with a white day mark from a post on a pile cluster at the east side of the basin.

A fixed red light, 12 feet above water, is shown from a post on a pile cluster on the west side northward of Rice Point.

Light buoy.—A black cylindrical buoy, showing a flashing white light, is moored in 22 feet on the east side of the basin at the sharp turn.

Buoy.—The northern side of the basin is marked by a red spar buoy.

West Gate Basin.—At the gate, west of the Duluth-Superior Bridge, a basin has been dredged to a depth of 20 feet, extending 480 yards westerly from the bridge and reaching from the westerly side of Rice Point to within 140 feet of the harbor line at the end of Connors Point. Channels leading from this basin to the draw spans of the Northern Pacific Railroad Bridge have been dredged to a depth of 20 feet, the one leading to the Minnesota draw having a width of 190 yards at the entrance from the basin, and the one leading to the Wisconsin draw a width of 165 yards at the entrance from the basin. The area of the basin, including the approaches to the draw spans of the above-mentioned bridge, is about 62 acres. The basin is intended

to aid vessels in passing to and from the adjacent channels and in shaping their course in approaching the Duluth-Superior Bridge and is not suitable for anchorage.

St. Louis Bay—North Channel.—The north channel extends from the Minnesota draw of the Northern Pacific Railroad Bridge to the Northern Pacific Railroad Bridge at Grassy Point, a distance of about 2.8 miles; for about 665 yards before reaching the bridge at Grassy Point it is common to the Duluth and Superior sides of the harbor. It has a depth of 20 feet or more for widths ranging from 130 to 200 yards, the wider portion being at the middle of the bend west of Rice Point.

Lights and buoys.—North Channel is well lighted and buoyed; for details consult the chart and light list.

South Channel extends from the West Gate Basin at the Wisconsin draw of the Northern Pacific Railroad Bridge to the North Channel, St. Louis Bay, a distance of about 1.8 miles; the distance by this channel from the West Gate Basin to the Northern Pacific Railroad Bridge at Grassy Point is about $2\frac{1}{4}$ miles. It has a depth of 20 feet or more with a width of 130 yards throughout.

Lights and buoys.—This channel is well lighted and buoyed; for consult the chart and light list.

Cross Channel is a cut through the flats of St. Louis Bay from the North Channel at the Missabe Ore Docks to the South Channel near the Island Creek Coal Dock. Its purpose is to facilitate the large ore shipments from the Missabe docks, and also to enable down-bound vessels to approach the Duluth-Superior Bridge more nearly at right angles to the direction of the bridge, avoiding the sharp turn necessary when approaching from the North Channel and lessening the danger of collision with the bridge piers.

The channel has a depth of not less than 20 feet and a minimum width of 215 yards near its southerly end, flaring out to a width of 265 yards at its junction with the South Channel and to 565 yards at its junction with the North Channel to provide easy turns. The bottom is rather stiff mud.

This channel is public and open to the use of all vessels.

Lights and buoys.—This channel is well lighted and buoyed; for details consult the chart and light list.

Howards Bay.—This natural inlet has been dredged as far as the shipyard and the two dry docks, about $1\frac{1}{4}$ miles from St. Louis Bay. The available depth up to the Lamborn Avenue Bridge, about 1,320 yards, is about 17 feet, and thence to the dry docks about 16 feet. The widths for these depths are: About 400 feet at the entrance, narrowing to about 200 feet at the bridge, where the channel passes through the south draw opening; above the bridge the 16-foot channel is about 100 feet wide.

Basin near West Duluth.—At the junction of the North and South Channels a basin extends about 330 yards easterly from the intersection of the prolonged north side of the South Channel with the prolonged south side of the North Channel, giving easy access from one channel to the other; it has a depth of 20 feet or more.

St. Louis River—Minnesota Channel.—This is a dredged channel, extending from the North Channel at the Northern Pacific Railroad Bridge, Grassy Point, to the natural channel of the river at the north end of Spirit Lake, a distance of about $4\frac{1}{2}$ miles. It is common to the Duluth and Superior sides of the harbor for a distance of about 1,130 yards from the bridge at Grassy Point, and has in this stretch a depth of 20 feet or more and a width of 130 yards or more. In the remaining portion it has a depth of 20 feet or more for a minimum width of 200 feet; in the long bend its width is 260 feet. This channel, from its location, is considered liable to shoaling in case of a heavy flood on the river. Such a flood has not occurred since the completion of the channel. The last soundings, in December, 1906, showed no shoaling of importance. There is little shoaling next to the left or westerly bank at the upper end of the curve near the outlet of Spirit Lake, but not enough to form an obstruction.

The Zenith Furnace Co. Slip leads from Minnesota Channel of St. Louis River above Grassy Point due north to the West Duluth blast furnace. This slip is 930 yards long and 50 yards wide, flaring out into a bell shape at its junction with the Government channel to permit of easy entrance by large vessels. It was redredged by the company in 1904 to a reported depth of 20 feet. The west side of the slip is on a line with the face of the company's wharf.

Buoys.—The slip is marked at its junction with the channel by Government red spar buoy No. 20 on the east side and by a private red spar buoy on the west side, and at the point where the channel narrows up to 150 feet by two private red spar buoys on each side.

St. Louis River—Natural Channel.—Between Grassy Point and Spirit Lake the meandering natural channel has been superseded by the more direct Minnesota Channel and has been blocked at various points by wharf construction and deposits of dredged material, so that only disconnected segments of it remain.

About 880 yards westerly from Grassy Point a cut-off channel, branching from the southerly side of Minnesota Channel, extends to Pokegama Bay and, passing on the easterly side of Big Island, connects with the Natural Channel a short distance above the upper end of the Minnesota Channel and at about $2\frac{3}{4}$ miles from the starting point.

This part of the river is lighted and buoyed; for details consult chart and light list.

Bridges, Duluth-Superior Harbor, St. Louis River, and Nemadji River.

No.	Location and name.	Kind.	Draw openings— clear width.		Clear height above low- water datum.	Motive power.	Remarks.
			Right.*	Left.*			
1	Duluth Canal.....	Aerial.....	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>		
2	Duluth-Superior at the Gate....	Railway and highway.	200	200	138 23	Electric. ...do....	See Note 1. See Note 2.
3	Northern Pacific Ry., St. Louis Bay:						
	Minnesota Channel.....	Railway.....	175	175	16	...do....	See Note 3.
	Wisconsin Channel.....	...do....	175	175	14.8	...do....	Do.
4	Howards Bay at Lamborn Ave- nue.....	Highway.....	123	123	5	Hand...	See Note 4.
5	Grassy Point.....	Railway.....	175	175	12	Electric.	See Note 5.
6	Transfer, New Duluth.....	Railway and highway.	125	125	22.4	...do....	See Note 6.
7	St. Louis County, at Fond du Lac.....	Highway.....			21.4		See Note 7.
8	Northern Pacific Ry., Nemadji River.....	Railway.....	59	59	13	Hand...	See Note 8.
9	Chicago, St. Paul, Minneapolis & Omaha Ry., Nemadji River.	...do....	98	94.5	31	...do....	See Note 9.
10	East Fourth Street, Superior, Nemadji River.	Highway.....			24.5		See Note 10.

SIGNALS FOR OPENING BRIDGE DRAWS.

Note 1.—Suspended car ferry, described in connection with Duluth Canal in text preceding. Signal to be given by vessels when approaching, 3 short blasts (— — —).

Note 2.—Deep water through each draw opening. Two fixed spans, one on each side of draw span; each has a clear opening of 270 feet and a clear height of about 22 feet; depth under south fixed span is 20 feet, and same depth is found under north fixed span to within 50 feet of the north end. Rafts are required to use the fixed span.

There is a red light on each end of the draw piers, a red light at each free end of the protection pier or draw rest, a red light on each side of the pivot pier, and three square lanterns on top of draw span showing red when bridge is closed and green when open.

Signal for opening draw, 1 long, 1 short, 1 long (— — —). On top of the cab above the whistle at this bridge is a 100-candlepower electric light signal, which gives a flash of the same duration and at the same time as the return whistle signal, working automatically with the whistle lever. This light is an aid to masters during heavy winds at night, when the reply might not be heard and the light could be seen.

Note 3.—Deep water through each draw opening. Wisconsin draw span is double tracked, crosses channel diagonally, and is 479 feet long. Minnesota span is single tracked, 425 feet long. Fixed rafting span next to Minnesota shore has 150 feet clear channel width and 16.4 feet clear height above low-water datum.

Lights are same as given under Note 2.

Signal for opening Minnesota draw, 1 long, 2 short (— — —); Wisconsin draw, 2 long, 2 short (— — —). Vessel signals are noted by a watchman in signal house midway between the two draw spans and reported by electric bell to bridge tenders.

Note 4.—Only the left, or southwesterly, opening can be used by large vessels; the right opening has only about 6 feet available depth.

There are three lights on the draw span, 15 feet above the floor, one at center and one at each end, showing red when bridge is closed and green when open; also a red light on each abutment, one on each side of center pier, and one at each end of draw rest.

Signal for opening draw, 3 short (— — —).

Note 5.—Deep water through each draw opening. There is a fixed span adjoining each end of the draw span, with 64 feet clear width of channel and 18 feet clear headroom. The available depth through the east fixed span is 8 feet or more, and through the west fixed span 5 feet or more.

There is a red light at each free end of the draw rest and two square lanterns on the draw span, one at each end, show white when bridge is open and red when closed.

Signal for opening draw, 2 short, 1 long (— — —).

Note 6.—Deep water through each draw opening. Bridge has 300-foot steel swinging span with two decks.

Signal for opening draw, 3 long (— — —).

Note 7.—Concrete arch; clear height given is at center. About 4 feet of water in span next to Minnesota shore and 7 feet in span next to Wisconsin shore.

Note 8.—Only 7 feet of water through the bridge openings.

Note 9.—Only the south opening should be used, where the depth is ample for boats that can navigate the river below the bridge.

Note 10.—This bridge has a fixed span with a clear opening of 141.5 feet.

Wharves.—The harbor has 9 iron-ore docks with a combined storage capacity of 942,500 long tons, 24 coal docks with a combined capacity of 11,305,000 short tons, 26 grain elevators with a storage capacity of 36,325,000 bushels and one cement elevator with a storage capacity of 114,000 barrels. All of these are private except that 24 of the grain elevators are public in the sense that they will handle grain for the public and are declared regular by the rules of the board of trade. For other kinds of freight there are 42 wharves in the harbor, 16 of which are open to public use, 8 without charge. The 14 more important wharves have a total warehouse or freight shed area of 1,376,390 square feet, of which 1,048,007 is available for public use. The remainder belongs to four private wharves.

Ice.—The harbor is ordinarily closed by ice for about 2½ months a year, usually in the months of January, February, and March.

Repairs.—Repairs of all kinds are made for vessels at the two dry docks of the Superior Shipbuilding Co., at Superior, and general repairs are made by the Marine Iron & Shipbuilding Co., of Duluth.

Dry docks.—The dimensions of the dry docks of the Superior Shipbuilding Co. located at the head of Howards Bay are as follows:

No. 1:	Feet.
Length over all.....	591.0
Length on keel blocks.....	562.0
Width at top.....	84.0
Width at entrance.....	64.0
Depth of sill below low-water datum.....	14.0
No. 2:	
Length over all.....	620.0
Length on keel blocks.....	605.0
Width at top.....	106.0
Width at entrance.....	66.5
Depth of sill below low-water datum.....	19.0

The dimensions of the floating docks of the Marine Iron & Shipbuilding Co. and the Great Lakes Dredge & Dock Co., located at Bay Front Slip, Duluth, are as follows:

Marine Iron & Shipbuilding Co.:	Feet.
Length.....	60.0
Clear inside width.....	57.5
Will admit vessels drawing.....	12.0
Great Lakes Dredge & Dock Co.:	
Length.....	95.0
Clear inside width.....	54.3
Will admit vessels drawing.....	12.0

NOTE.—The floating docks are open at the ends so that the length of boat docked is not limited to the length of dock.

Storm warnings.—At Duluth, day and night signals are displayed from a steel tower on the southwest side of the United States Weather Bureau building, corner of Eighth Street and Seventh Avenue West. At Superior day and night signals are displayed from a steel tower on the outer end of the Great Northern Railway Ore Dock No. 1, facing Superior Entry.

Coast Guard station is located on Minnesota Point, about $\frac{1}{2}$ mile southerly from the Duluth Canal.

Radio station.—A radio station is operated all the year by the United States Navy. After close of navigation station is not open from 8 p. m. to 8 a. m. Call letters NUX; working distance 150 miles.

Coast.—From Duluth the coast trends northeasterly for about 25 $\frac{1}{2}$ miles to Two Harbors (Agate Bay). It is rocky and bold, free from outlying dangers, and can be approached with safety in clear weather within 440 yards, except at Knife Island.

At Sucker River, about 15 miles northeast of Duluth, the point of land at the east side of the bay affords some shelter from northeast storms, but there is no landing.

Knife River and Island, about 19 miles northeast of Duluth, afford but slight shelter from south and southeast winds. There is a gravel spit across the mouth of the river, but good water between the river mouth and the island. Rocky bottom and reefs connect Knife Island with Granite Point on the mainland. Vessels bound for Knife River must round Knife Island at 440 yards to the northeast.

A wharf 46 feet wide and 120 yards long, extends eastward into the lake from a small rocky point on the south side of the mouth of Knife River, and is used, mainly, for receiving coal. The outer 40 yards of the wharf, where vessels work, has a concrete superstructure. The depths along this 120 feet or working portion are 20 to 24 feet at the outer end, 17 feet at the middle on both the north and south sides, and 10 feet at the inner end. Vessels can work on either side of the wharf in calm weather, and on the south side if a little rough, but can not remain during a storm. Shelter can be had at Two Harbors, 6 $\frac{1}{2}$ miles away, or at Duluth, 19 miles distant.

Caution.—Special attention should be given to the local magnetic attraction along this stretch of coast. The resulting error tends to set a vessel inshore.

Two Harbors (Agate Bay), is an important ore-shipping point and a harbor of refuge. It is a natural bay or indentation about 1,320 yards long and 880 yards wide, and originally had deep water at the entrance and throughout much of its extent, but was directly

exposed to winds from southeast through south to south-southwest and to heavy swells from northeast and southwest winds.

Harbor.—The space between the two breakwaters is the harbor entrance and has a clear width of about 400 yards, after allowing for the riprap embankment. The water area within is about 109 acres, over about 70 acres of which there is a depth of 18 feet or more. Four ore docks of the Duluth & Iron Range Railroad occupy a large portion of this area, leaving no more room than necessary for vessels to enter and make the turns in and out of the slips, and no space for anchorage. The approaches to the ore docks have depths of 21 feet and upward, and the owners report 21 feet as the depth alongside the docks. Vessels can remain in this harbor during severe storms, but they are not allowed to tie up to the breakwaters. They can, however, tie up without expense to any unoccupied portion of the coal dock. There are no other special harbor rules or regulations. No harbor lines have been established.

Two Harbors Light, group flashing white, 78 feet above water, visible 17 miles, is shown from a red, square tower on a dwelling on the point between Agate and Burlington Bays.

Fog signal.—The fog signal is made on a steam whistle.

Lights.—A flashing white light, 20 feet above water, visible 7 miles, is shown from a black mast on the west breakwater.

A fixed red light, 33 feet above water, visible 12 miles, is shown from a white, square, pyramidal tower on the outer end of the east breakwater.

Fog signal.—The fog signal is made on a siren.

Storm warnings.—Day and night signals are displayed from a steel tower on the outer end of the Duluth & Iron Range Railroad Ore Dock No. 6, about 250 yards from the east end of the west breakwater.

Burlington Bay, about 1 mile east of Agate Bay and the town of Two Harbors, is 1 mile wide and extends about 900 yards into the land. The water deepens from the inner shore line to 60 feet and more at the entrance. From the shore line to a depth of 25 feet the bottom consists of gravelly clay, bowlders, and ledge rock; from that depth to a depth of 60 or 65 feet, firm clay; and in greater depths, mud bottom. The bay is considerably protected from southwest storms by the point of land lying between it and Agate Bay, but is subject to a wash from that direction. It is open to the south and east, but storms from these directions are very rare. It is partly protected from the northeast by the easterly point of land, but the northeast storms are so severe and the fetch of the waves so great that the sea rolls around into the bay with a good deal of force and renders it unsafe for vessels.

Coast.—From Burlington Bay the coast extends northeasterly for 80 miles and has very little shelter from storms. The coast is bold and may be generally approached within 880 yards, but a number of dangers lie close along this shore.

A rock shoal with 7 feet of water lies 440 yards offshore at the mouth of Silver Creek, $4\frac{1}{4}$ miles northeasterly from Two Harbors Light.

Encampment Island, 3 miles northeast of this rock and 880 yards from the shore, has a shoal with limiting depth of 13 feet extending from it west and northwest to the mainland. About 4 miles northeast of Encampment Island a patch of rocks extends out 660 yards from the shore.

Gooseberry River, about 39 miles northeast of Duluth and about $13\frac{1}{2}$ miles northeast of Agate Bay, is exposed to northeast storms. An extensive gravel spit extends southerly from its mouth. Good water exists up to the gravel beach, to which coasting vessels can proceed in quiet weather.

Gooseberry Reef, with 11 feet least depth, lies 880 yards from shore and 1 mile south of Gooseberry River, bearing 1,200 yards 174° (S. by E.) from the extremity of Gooseberry Point; this reef forms the most dangerous obstruction to vessels coasting in this locality, and a careful lookout should be kept.

Split Rock is an abandoned small settlement at the mouth of Split Rock River, 43 miles northeast of Duluth. The harbor is a natural indentation affording shelter from westerly, to northerly storms, some protection from northeast storms (the latter being the most dangerous at the westerly end of the lake), and less protection from southwest storms. There are no severe storms from the south and east.

Split Rock Light, flashing white, 168 feet above water, visible 22 miles, is shown from a buff octagonal tower, with a fog signal house near by, on the promontory $1\frac{1}{4}$ miles northeast of Split Rock Point.

Fog signal.—The fog signal is made on a siren.

Corundum Point is about 1 mile northeast of Split Rock and 7 miles southwest of Beaver Bay. There is no landing here.

Reported shoal.—An uncharted reef with an estimated depth of 18 or 20 feet is reported abreast of Little Two Harbors, and from 440 to 880 yards from shore. The reef drops off suddenly on its east side and gradually slopes into deep water in the opposite direction. As reported, the shoal is out of the course of large vessels and is not an obstruction to light-draft coasting steamers. It might prove dangerous to launches and similar small craft by reason of the swell or wave thrown up by the steep face on its east side.

Beaver Bay, about 51 miles northeast of Duluth, is an indentation extending about 500 yards into the coast line, with greatest width of about 1,200 yards and area of about 120 acres. The shore is bordered by bluffs rising 75 to 200 feet above the surface of the lake, which afford shelter to some extent to vessels in the bay against storms from the south, west, and north. To the southeast, east, and northeast the bay is open and unprotected. The most dangerous storms experienced at this end of the lake come from a northeasterly direction, the sea then having an extreme fetch of more than 250 miles. The 16-foot curve is generally close to the shore line, at distances from it varying from 30 to 200 feet. Large bowlders are in all parts of the bay. The old wharf is no longer a suitable landing place for coasting vessels. There is a pier 40 feet long, with 12 feet of water at its outer end, in the east bay. (Information of December, 1919.)

Beaver Island lies about 440 yards offshore $1\frac{1}{2}$ miles to the northeast of Beaver Bay. There are patches of rocks within 880 yards of the shore just above Beaver Bay, and also at a point 1,320 yards to the northeast of Beaver Island.

Crystal Bay is a harbor on the north shore, 58 miles from Duluth and 1 mile northeast of the mouth of Baptism River, developed in connection with the mining, crushing, and marketing of corundum. The harbor is well sheltered from the southwest, west, northwest, and north, and to some extent from the northeast. A rock awash lies about 200 yards from shore just above Crystal Bay.

Two Islands (Saxton) are located from 330 to 460 yards offshore at the mouth of Two Islands River, 50 miles northeast of Two Harbors and 31 miles southwest of Grand Marais. The westerly island is 400 yards long and the easterly island 260 yards long, parallel to the shore, and there is an opening of 330 yards between them. A reef, with shallow water, extends eastward nearly 330 yards from the east island. Ample depth of water exists behind and between the islands, and the bottom is good holding ground. The islands afford some protection from prevailing storms, and tugs at anchor frequently ride out ordinary storms, but have at times been driven ashore during severe gales. There is no town or settlement at this locality.

Cross River (Schroeder) is a small settlement with a post office, about 2 miles northeast of Two Islands. There is a new wharf on the east side of the mouth of the river about 75 feet long and 12 feet wide, with 10 feet of water alongside. There is no protection from storms.

Tofte is a landing about 81 miles northeast of Duluth and 4 miles northeast of Cross River. There is a wharf, built on three rock-filled cribs, extending 140 feet or more into the lake and with 9 to 12

feet depth at the outer portion. It is not a sheltered harbor, but landings can be made in calm weather. Commodities are fish, cedar ties, and posts.

Lockport is a settlement 18 miles west of Grand Marais and $1\frac{1}{2}$ miles east of the mouth of Poplar River. At this locality the National Power & Paper Co. has an extensive pulp and paper plant, utilizing the water power of Poplar River. A substantial wharf, built by this company, consists of rock-filled timber cribs, having a concrete superstructure, extending about 170 feet from shore. Depths of 11 feet exist at the outer end of the wharf and for a distance of 50 feet toward shore along the west side; at 70 feet from the outer end the depth is 8 feet, and $5\frac{1}{2}$ feet at the inner end of the working face, which is 123 feet from the outer end. The wharf is reported to be somewhat damaged at about midway of its length, but is serviceable for landing. The bottom is rocky. There is but little protection at the wharf from northeast storms and none from the southwest.

Good Harbor Bay, about 5 miles westerly from Grand Marais, is sheltered on the west by Terrace Point. Rock Island lies about 1,320 yards offshore and $1\frac{1}{2}$ miles east by north of Terrace Point, in the easterly approach to the bay, forming a menace to be avoided in thick weather.

Grand Marais.—About 107 miles northeast of Duluth, and the only safe harbor on the north shore between Two Harbors and the international boundary, a stretch of about 126 miles of exposed coast. It is about 81 miles from Two Harbors, to the southwest, and about 38 miles from Wausaugoning Bay, a partially protected natural harbor to the northeast. It consists of a semicircular bay with a practically uniform radius of 440 yards, facing to the south, and containing about 61 acres of water area, with two breakwaters at the entrance.

The outer ends of the breakwaters are 160 yards apart in northeast and southwest direction.

Harbor.—The easterly section of the harbor, which includes the dredged basin of 26 acres, is well protected from all storms. There is good anchorage for a few vessels only in the dredged area, which has a least depth of 15 feet, and generally from 16 to 18 feet. There are two wharves at which vessels may moor; they are not allowed to tie to the breakwaters. The westerly portion of the harbor is shoal, exposed to southeasterly storms, and considerably exposed to swells from northeast storms. Vessels entering during a northeast storm should keep well over to the east breakwater to avoid getting into the shoal water to the west.

No harbor lines are established and no special rules or regulations are in force.

Light.—A flashing white light, 38 feet above the water, visible 13 miles, is shown from a white square pyramidal tower located about 60 yards from the outer end of the east breakwater.

Fog signal.—The fog signal is made on a bell.

Caution.—As the outer end of the east breakwater is not marked mariners entering the harbor must be guided by the red light on the west breakwater.

West Breakwater Light, occulting red, 36 feet above water, is shown from a white skeleton steel tower located on the outer end of the breakwater.

Reef.—From the rocky point in the lake to the east of the harbor entrance a reef runs easterly about 360 yards; it is narrow and has a depth of $7\frac{1}{2}$ feet near its outer end. A portion of this reef lying from 200 to 500 feet from shore has from 15 to 24 feet of water over it.

Radio station.—There is a radio station at Grand Marais.

Coast.—From Grand Marais to Grand Portage Bay, about 34 miles northeasterly, the coast is rocky and bold, with deep water close to shore and a few outlying rocks. Owing to frequent fogs and the local disturbance of the magnetic needle in this locality, the coast should not be approached nearer than 1 mile.

Guano Rock, detached, lies 5 miles 74° (ENE. $\frac{1}{4}$ E.) from Grand Marais Light and 880 yards off shore.

Marr Island, low and rocky, is on the outer end of a reef which extends 665 yards from the small point about 13 miles northeast of Grand Marais and about $1\frac{1}{2}$ miles southwest of the mouth of Brule River.

A detached 5-foot rock lies about 1,165 yards southwesterly from the west entrance point of Grand Portage Bay and about 500 yards offshore.

Hovland (Chicago Bay) is a small settlement on a small bay 18 miles northeast of Grand Marais, Minn. A wharf composed of rock-filled cribs and a deck in the west part of the bay, runs out into 8 or 9 feet of water at a distance of about 100 feet from the beach. There is good shelter from southwest and northwest winds and good anchorage.

Grand Portage Bay is about 5 miles southwesterly from the international boundary. Its width at the entrance is about 2 miles and its extension into the shore line about $1\frac{1}{4}$ miles. It is exposed to the southeast, south, and southwest, being sheltered by the land partly surrounding it from west, north, and east winds. To the west there is low, level land, thickly timbered. To the north the ground rises rapidly, reaching an elevation of nearly 400 feet above the level of the lake. On the east side of the bay, Hat Point, a high rocky peninsula, juts out into the lake and separates Grand Portage from

Wauswaugoning Bay. The water in Grand Portage Bay is generally shallow; a depth of 12 feet obtains over about one-third and 16 feet over one-fourth of the area. Vessels of 8 feet draft entering the bay can not safely approach nearer than 880 yards from shore.

Grand Portage Island is situated directly in the mouth of the bay, dividing the entrance into two passages; there is a very good wharf on the northerly side of the island, with 10 feet of water alongside. A rocky shoal with 6 feet depth lies 660 yards southwest of Hat Point and 880 yards east of Grand Portage Island.

Wauswaugoning Bay, near the international boundary, lies northeast of Grand Portage Bay, being separated from it by Hat Point. It is about 2 miles in average width and extends about $1\frac{1}{2}$ miles within the line of the mainland entrance points. The area comprises about 1,800 acres. The western boundary of the bay consists of a continuous rocky cliff, rising in places about 100 feet above the lake level. The northern portion is bordered by a boulder beach, with occasional rocky cliffs projecting into the bay. Beyond the boulder beach rises an immense bluff over 165 yards in height. The land on the east of the bay is low, level, and heavily timbered. From the northwest Mount Josephine rises to a height of 700 feet. A rock shoal with an area of about 2,700 square feet lies nearly $1\frac{1}{2}$ miles north of Hat Point and 880 yards from the westerly shore. From the easterly mainland point of the bay a reef of rocks extends in a westerly direction to beyond Birch Island. Generally the depth of water is great and the shores deep-to, except in the northeast head. The bay has good holding ground for anchorage, but is exposed to the southeast, south, and southwest.

To the east of Wauswaugoning Bay and southwest of Pigeon Point there exist many islands and reefs. A dangerous detached rock lies 590 yards to the southeast of the southerly point of Lucille Island and must be carefully avoided. There is shoal water with 11 feet available depth between Susie and Lucille Islands; a 24-foot channel can be found between Susie Island and the main shore, but should not be attempted by strangers.

Clarks Bay is located on the south side of and about $3\frac{1}{2}$ miles westerly from the extremity of Pigeon Point and about 1 mile northeasterly of Susie Island. A wharf about 50 feet long, of stone-filled timber cribs, along the south shore of the bay near its inner end has 10 feet or more of water along its face, with deep water approaching. There is good shelter from all but easterly winds. (Information of December, 1919.)

Pigeon Bay, Minn. and Ont., is at the mouth of Pigeon River, the international boundary line passing through the river and bay. The bay is about 1 mile in width and 3 or 4 miles in length, with great depth of water, and bordered by high hills or bluffs, which protect

it completely, except toward the east. The southerly shore of the south arm is bold, with deep water close to the shore. A dangerous reef with small islets, called Boundary Island, running 880 yards east and west and being 120 yards wide, lies nearly in the middle of Pigeon Bay; the western extremity of this reef is 900 yards southwest by west of the point separating the north and south arms of the bay.

Laura Grace Rock, with 5 feet of water on it, is very small and lies 1,130 yards northeast by east from the south entrance point of Pigeon River and exactly in line between the northeast bunch of mooring piles off the river and the north shore of Pigeon Point 500 yards from the former.

Acadia Rock, with $4\frac{1}{2}$ feet least water over it, is also small and lies about 460 yards east from Laura Grace Rock.

Both rocks are south of the trend of the islands in the mouth of the south arm and are inside the 10-fathom curve. Outside these rocks the water is deep. Mariners should use the bay with great caution, as the rocks render the anchorage space dangerous. The holding ground is not good. A vessel requiring shelter in this locality will find it in Little Trout Bay (about 6 miles northeast) in less than 10 fathoms good, stiff mud.

Isle Royal, Mich., and vicinity.—Isle Royal has an extreme length from southwest to northeast of about 44 miles and a maximum width, near the southwest end, of about 9 miles. The rocky and irregular formation of its shores results in numerous indentations and detached islets and reefs. Good lees can be found in the many bays and channels around the northeast end.

Chippewa Harbor is an indentation on the south shore of Isle Royal northeastward of Siskiwit Bay, opening to the southeast, with a general width of about 215 yards for approximately 580 yards from the entrance, where the shores contract to a narrow passage a few feet in width and 8 feet deep, leading to inner harbors. The water in the outer harbor varies from 20 fathoms at the entrance to 36 feet near the head, with rock bottom.

Siskiwit Bay, on the south side, is the largest indentation in the island and affords protection in all winds excepting those from the northeast, with good holding ground $1\frac{1}{2}$ miles south of Wright Island. There is foul ground within 880 yards of Wright Island. On its south side the bay has a double line of islets stretching for 8 miles in the general direction of the south shore, connected by hidden reefs and having also some reefs outside; no attempt should be made to enter between the islets.

Wright Island is at the northeasterly end of the bay and has a small pile wharf 15 feet long, with 13 feet of water, which is located on the channel side. (Information of December, 1919.)

Isle Royal Light, flashing white, 72 feet above water, visible 15 miles, is shown from a white octagonal tower with a dwelling attached located on the east end of Managerie Island.

The south coast of Isle Royal from Siskiwit Bay westerly to the most southern point of the island should generally be given a berth of at least 1 mile because of the existence of ledges and rocky spots, rendering the coast very dangerous.

Rainbow Cove is a crescent-shaped indentation at the southwest end of Isle Royal, about $2\frac{1}{4}$ miles wide; it has rock bottom and 21 to 60 feet of water, with the 8-foot curve about 330 yards from shore.

Grace Harbor and Washington Harbor, in the westerly end of the island, are good, the former giving protection in all except southwest winds, with generally good holding ground, and the latter from all winds, with good holding ground. In Grace Harbor there is a wharf which is 75 feet long, with about 20 feet of water alongside. On the easterly projection of Washington Island there is a crib wharf 150 feet long, facing in to Washington Harbor, with about 20 feet of water alongside. There is a spot, slightly submerged, 1,320 yards southwest from Washington Island and on the north side of the entrance to Grace Harbor, and there are many detached rocky shoals within a distance of 3 miles to the southwest and northeast from Washington Island, in the vicinity of Rock of Ages, which must be carefully avoided in approaching or leaving these harbors. Entering Washington Harbor there are a number of shoals about 590 yards north of Washington Island and on the north side of the vessel course, and other shoals about 360 yards north of Grace Island and to the south of the course. In Washington Harbor there is a crib wharf 50 yards long, with 14 feet of water at the outer end.

Rock of Ages, off the westerly end of Isle Royal and about 2.4 miles west of the most westerly point of Washington Island has 4 spots with depths of 6 to 16 feet lying from 1 to $1\frac{3}{8}$ miles northeast of it and close north of the line of approach from Rock of Ages Light to Washington Harbor. Several shoals with from 3 to 10 feet of water exist within a distance of 1 mile to the south and southwest of Rock of Ages.

Light.—A group flashing white light, 117 feet above water, visible 19 miles is shown from a buff conical tower off the west end of Isle Royal.

Fog signal.—The fog signal is made on a siren.

Buoy.—A red spar buoy marks the most southerly spot of the shoals southward of Rock of Ages Light.

The north shore of Isle Royal from McGinty Cove at the westerly end to Todd Harbor, about midway of the island, is bold and for most part deep-to; but at a point about $6\frac{1}{2}$ miles from McGinty Cove two spots with 10 to 17 feet depths lie within $\frac{3}{8}$ mile of the shore, and

point to Little Trout Bay, with clean shores, excellent anchorage in less than 10 fathoms, and shelter from all winds. Cloud Bay, $1\frac{1}{2}$ miles northwest of McKellar Point and really an arm of Little Trout Bay, contains limited anchorage space in its middle, the shores being shallow. A channel 14 feet deep and 75 feet wide through a bar gives access to Cloud River, which runs into Cloud Bay; from the river mouth the channel extends east-southeast.

Buoys.—Two red spar buoys mark the northern edge of the channel at the outer and inner ends.

Sucker Island is a small island 2 miles northeast of McKellar Point. It is surrounded by shallow water for a distance of 200 yards. The shore between it and Cloud Bay is deep to.

Caldwell Island, 880 yards east of Sucker Island, has very little shallow water off it.

Caldwell Point, a low gravel point, covered with grass, lies 3 miles northeast by east from McKellar Point and about $1\frac{1}{4}$ miles northeast by north from Victoria Island Lighthouse. It is important on account of the small rock with 4 feet of water over it, lying 500 yards south by west from it.

Buoy.—A red spar buoy marks the 4-foot shoal spot.

Jarvis Bay.—Jarvis Point lies $1\frac{1}{2}$ miles northeast of Caldwell Point, and between them is a slight indentation with steep shores; the point is deep to on all sides. Jarvis Bay is an indentation about 1 mile square, lying to the northward and westward of Jarvis Point. In the north corner, called Prince Bay, will be found shallow anchorage for small boats, and in the southwest corner limited space for large craft. Mink Point, also steep to, lies $2\frac{1}{4}$ miles northeast of Jarvis Point.

Mink and Sister Island.—Mink Island, $1\frac{1}{2}$ miles long, quite narrow and high, lies 750 yards east-northeast of Mink Point. The island has deep water all around it, and the channel between the point and island is deep and clean. Sister Islands, two in number, lie 1,320 yards to $1\frac{1}{4}$ miles east-northeast of the northeast end of Mink Island; they are steep to on all sides.

Mink Island Reef, a rock awash, lies in the middle of the passage between Mink Island and the Sisters, having good water between it and the latter, through which nearly all the boats pass.

Beacon.—A white beacon 15 feet high marks Mink Island Reef.

Vessels passing this beacon on the northwest, northeast, and south-east sides should not approach nearer than 100 yards.

Between the beacon and Mink Island is a small rock with 5 feet of water over it, 150 yards from the beacon; otherwise the channel between the beacon and Mink Island is clean. Sly Rock, with 3 feet over it, lies 500 yards east-northeast of the northeast Sister Island.

Mink Point to Flatland Island.—Sturgeon Point, marked by a small islet off it, is situated $2\frac{3}{4}$ miles north-northeast from Mink Point; it also is steep-to. The bay between its shore and Mink Island is called Mink Bay and contains good anchorage in its southwest corner, between the two small islets there. Sturgeon Bay is a shallow bay with a narrow entrance, 1 mile west of Sturgeon Point. Off the north shore of Sturgeon Point will be found good anchorage. North by east 1,200 yards from Sturgeon Point, and 400 yards southerly off the shore abreast of it, is a small boulder shoal, with only 2 feet of water over it, called Zealand Spit.

Flatland Island, $2\frac{3}{4}$ miles northeast of Sturgeon Point, is, in marked contrast to all the other islands in the vicinity, low and flat. From its southwest point, a reef and a long, narrow island almost connect it with the mainland at Wiley Point, but off the west side is an excellent harbor, with from 3 to 4 fathoms of water in it; the entrance being from the north between Birch Island and the mainland. From the southeast point of Flatland Island extend several small islands and rocks for 1,320 yards in an east-northeasterly direction, the outer one, Campbell Island, being clean at its north end.

Alexander Reef, detached and with scant water on it, is 665 yards east-southeast from the southeast point of Flatland Island and 665 yards south-southwest from Campbell Island. A dangerous reef, with only 4 or 5 feet of water at its outer end, extends $1\frac{1}{4}$ miles north by east from the north side of Flatland Island, to clear which on the north end, keep the lower bluff on Thunder Cape in sight north of Pie Island, bearing 74° (ENE. $\frac{3}{4}$ E.) and to pass east keep Spar Island open east of Flatland Island, bearing 188° (S. $\frac{1}{2}$ W.).

Flatland Island to Port Arthur.—The mainland shore from Birch Island $6\frac{1}{2}$ miles northerly to Grand Point is clean except for Squaw and Brule Bays (near Grand Point), in which the water is not very deep. Off Grand Point a very shallow bank lies about 440 yards, leaving good water inside, its outer side being about 660 yards off the point. From Grand Point to Port Arthur the shore is fronted by a shallow mud flat for an average distance of 1,320 yards. The principal mouth of the Kaministiquia River and entrance to Fort William is situated 6 miles north of Grand Point.

Victoria Island to Thunder Cape.—Victoria Island is the southernmost of a long, narrow string of islands that stretches from Little Trout Bay northeasterly 27 miles nearly to Thunder Cape, and gives shelter to an excellent channel from Victoria Island to Port Arthur.

Light.—A fixed white light, 45 feet above water, visible 12 miles, is shown from a white, square structure on the northwest end of Victoria Island.

Fog Signal.—The fog signal is made on a hand horn.

Reef.—Off the extremity of the western point a shallow reef extends 150 yards in a west-southwesterly direction. This is especially dangerous for vessels entering or leaving the inside passage, as it juts into the channel.

Buoy.—A black spar buoy marks the outer end of this reef.

Cosgrave Bay, south of the lighthouse point, is rather deep for anchoring, but the shores are clean.

Iroquois Rock, with $4\frac{1}{2}$ feet of water on it, lies 1,000 yards west-southwest from the lighthouse point and is a dangerous rock, leaving a deep channel over 700 yards wide between it and the reef off the lighthouse point. As the rock is very small, vessels may pass upon either side of it.

Buoy.—Iroquois Rock is marked with a red and black spar buoy.

Clearing marks.—To pass north of Iroquois Rock, keep Sugarloaf Hill on Spar Island in sight north of Victoria Island bearing 66° (NE. by E. $\frac{1}{4}$ E.), and to pass south of it bring the northwest side of Spar Island in range with Victoria Island Lighthouse, 59° (NE. by E. $\frac{1}{4}$ E.).

Tiger Island is the high black island lying 660 yards south of Victoria Island Lighthouse. It and the small islands stretching 2 miles east of it are quite clean.

Victoria Cove is a large bay in the east side of Victoria Island, but the water in it is about 14 fathoms deep. A couple of shallow rocks lie off Rolland Rock (dry), at the southeast entrance to this cove; one is 300 yards northeast and the other 150 yards south of it. Another rock with only 2 feet of water over it lies nearly in the middle of the entrance to the cove and must be carefully guarded against by keeping rather nearer the southwest side. The remainder of the southern and all the northern shore of Victoria Island are quite deep-to.

Outlying islands between Victoria and Pie Islands.—Devil and Jarvis Islands, with a few islets, are next in line northeast of Victoria Island, extending to Spar Island. They are quite clean off their northwest and southeast sides. A narrow channel with 20 feet of water in it exists between Devil and Jarvis Islands. Spar Island is about $2\frac{1}{2}$ miles long northeast and southwest by 880 yards wide. Spar Reef, a rock awash, lies with its outer edge 440 yards off a point on the northwest side and 1,320 yards from the southwest end. With this exception the shores are clean. There is a safe, clean passage 440 yards wide through the islets between Spar and Jarvis Islands, with 13 fathoms of water in it.

Thompson Island lies with its southwest end $2\frac{1}{2}$ miles northeast of Spar Island; it is $3\frac{1}{8}$ miles long northeast and southwest by 660 yards in greatest width, and is over 250 feet high, with deep water

all around it. In the gap between Spar and Thompson Islands are numerous small islands and rocks, dry or sunken, with good passages between them, but which should not be attempted by strangers without a chart. Stretching northeast from Thompson Island for 1,320 yards to McKellar Island are several small islands with no passages between them, but which have good, clean shores on either side. The gap between these islands and Pie Island is very deep and clear of obstructions.

Pie Island and vicinity.—Pie Island, 850 feet high, is about 7 miles long east and west by 4 miles wide, and has only slight indentations in its shores, except the southerly. The shores are clear of dangers, except the north and northeast, which should receive a berth of 880 yards. Good anchorage from southerly winds will be found off the north and northwest sides, and from northerly winds off the south side. Dawson Bay in the south side is large, but the water is deep. The lighthouse on Pie Island is on the west side, immediately west of Le Pate, the highest part of the island. Steamboat and Deadman Islands are small and lie from 1 to $1\frac{1}{2}$ miles off the southwest side of Pie Island. They are clean outside a distance of 200 yards, and between them and Campbell Island and Alexander Reef is a good clean passage 1,500 yards wide and from 5 to 13 fathoms deep.

Angus Islands, Hamilton Island, and Cone Island are a small group, six in number, lying 1 mile southeast of the east point of Pie Island. There is a shallow spit making out 440 yards northeast from the north end of Angus Islands, and with this exception the islands are clean. To the southwestward of the group and abreast of the southeast side of Pie Island is Craig Rock, awash, lying about 1.1 miles 286° (WNW. $\frac{1}{4}$ W.) from Cone Island; Baker Rock, with 2 feet of water on it, lying 2 miles 90° (E. $\frac{1}{4}$ N.) from the south point of Pie Island; and Lord Stanley Rock, the most important, with 4 feet of water over it and a 7-foot spot close southwest of it, situated 1.4 miles 111° (ESE. $\frac{1}{4}$ E.) from the same point. As these rocks lie inside the line joining Cone and McKellar Islands, masters of vessels need not be so much afraid of this shore as they appear to be.

Pie Island Light, fixed white, 34 feet above water, visible 11 miles, is shown from a white square tower on the western side of the island.

Fog signal.—The fog signal is made on a hand horn.

Passage between Pie Island and Thunder Cape.—This passage is $5\frac{1}{2}$ miles wide, is quite clean. Thunder Cape is a very prominent headland, marking the east entrance to Thunder Bay. The cape is 1,000 feet high near its south end and 1,200 feet on the summit of the Sleeping Giant, as the high land between Sawyer Bay and the cape is called. All parts of the cape may be approached to 200 yards.

Thunder Cape Light, fixed and flashing white, 45 feet above water, visible 12 miles, is shown from a white square tower on the southern end of the cape.

Fog signal.—The fog signal is made on a diaphone.

Hare Island is small, 20 feet high, $1\frac{1}{2}$ miles northwest of Thunder Cape. Shoal water extends 830 yards south-southwestward from its south end, and a shallow rock with 10 feet of water over it lies 330 yards west by north from its northern end. Otherwise the island is clear outside a distance of 450 feet.

A patch with only 23 feet of water over it lies about 1,230 yards southwest of the extremity of the reef extending from Hare Island.

Light and bell buoy.—A red cylindrical buoy, showing an occulting red light, is moored 2 miles 274° (W. $\frac{1}{2}$ N.) from Thunder Cape Light.

Fog signal.—The fog signal is made on a bell sounded by the action of the waves.

Thunder Bay (Ontario) is a fine sheet of water extending $34\frac{1}{2}$ miles in a northeast and southwest direction, with width of 15 miles northwest and southeast, narrowing at both ends. On its shores cliffs rise from 1,000 to 1,350 feet out of the lake.

The northwest coast of the bay, extending from Bare Point about 20 miles northeasterly to its head, may generally be approached within 1 mile. Papoose Islands, lying 1 mile east of Wild Goose Point and about 6 miles from Bare Point, have no outlying dangers off them beyond 200 yards. About 3 miles northeast of Wild Goose Point and 1,320 yards offshore Mary Island runs about 1,540 yards northeast and southwest, inclosing Mary Harbor, which affords anchorage in 3 to 7 fathoms, bottom clay. Silver Harbor is a small bay with no wharf or range lights, just north of Mary Island and 9 miles from Bare Point. About $1\frac{1}{2}$ miles farther northeast is McKenzie Bay, generally shallow and rocky, with Lefebvre and Bacon Islands in its mouth. Northeast of McKenzie Bay and separated therefrom by Conmee Point is Amethyst Bay, having deep water within 660 yards of the shore, but obstructed by several small islands, including Buck and Kent Islands, with shoals near them. Amethyst Harbor is the northeast extremity of the bay, inclosed by Perry Point with Lambert Island reaching 1,320 yards southwesterly therefrom. Keshkabuon Island, $2\frac{1}{2}$ miles long east and west by 880 yards in greatest width, lies easterly off Amethyst Bay, with its west end 1 mile south of Perry Point. Temple Rock, awash, is a detached spot 880 yards westerly from its west end. In the bight between Perry and Knobel Points are Chipman Rock, with 5 feet of water, and Sour Island, with shallow water surrounding it.

The whole easterly shore of Thunder Bay, trending about 20 miles south-southwest from the head to Thunder Cape, is very clean and

bold, and may be approached to within 440 yards. Clavet Bay, under Clavet Point, about midway of the east shore, and farther south Hoorigan Bay, under Hoorigan Point, are of similar shape, both opening to the southwest. Sawyer Bay is situated $5\frac{1}{4}$ miles north of Thunder Cape and contains good shelter and holding ground in all winds except those between west and north.

Welcome Islands, four in number, lie about 4 miles southeast of the entrance to Fort William. The northern two are each about 880 yards long and 440 yards wide, and are about 440 yards apart. The other two are quite small and are situated on a shoal bank reaching about 1,540 yards south from the western one of the two main islands. Shoal water extends 440 yards off along the south side of the eastern island, and in the bay on the east side of the group are two shoals with 8 and 10 feet over them, 880 yards offshore; the northerly shores are clean. The channel between Welcome Islands and Mutton Island, off the mouth of Kaministiquia River, is $1\frac{1}{4}$ miles wide and from 4 to 8 fathoms deep.

Welcome Islands Light, occulting white, 112 feet above water, visible 16 miles, is shown from a white dwelling on the northeast end of the islands.

Fog signal.—The fog signal is made on a diaphone.

Light buoy.—A red cylindrical buoy showing an occulting red light is moored in 24 feet on the south end of the shoal extending south from the west Welcome Island.

Approaches to Fort William and Port Arthur.—Vessels proceeding to Port Arthur and Fort William from the eastward should pass to southward of Thunder Cape and Hare Island gas and bell buoy and then shape a course to pass 880 yards clear of the northeast end of the Welcomes, or heading upon Port Arthur Lighthouse. If bound for Fort William, a vessel may keep this course until the range comes on.

Vessels from Duluth for Port Arthur or Fort William in thick weather keep nearer Isle Royal and enter the bay close to Thunder Cape. There is no reason why vessels should not keep closer to the Canadian islands, give Angus Islands a berth of 880 yards, and haul up 329° (NNW. $\frac{1}{4}$ W.) to clear the Welcomes by the same distance. In clear weather vessels trading between Port Arthur and Duluth use the shorter and more sheltered passage west of Pie and Victoria Islands. From Duluth to Port Arthur, shortly after passing Cloud Islands, bring the west side of Sister Islands in range with Caldwell Point, 46° (NE. $\frac{1}{4}$ N.) to pass between Iroquois Rock and the reef off Victoria Island. If these marks can not be distinguished and there is no buoy on Iroquois Rock, a vessel should haul close to Tiger Island and steer to pass 300 yards off Victoria Island until the east end of Tiger Island comes in range with the

west or lighthouse point of Victoria Island. Now alter course to pass about 200 yards off the north side of Victoria Island to avoid the 4-foot shoal off Caldwell Point. When abreast of Caldwell Point steer for the northwest side of Spar Island for $2\frac{1}{2}$ miles, or until the west side of Pie Island comes in range with the west side of the Sisters, bearing 34° (NNE. $\frac{1}{4}$ E.); keep on this range for $3\frac{1}{2}$ miles. This will clear the rock awash, marked by a concrete beacon, between the Sisters and Mink Island. Pass through the passage, giving West Sister a berth of 200 yards, and head up for the west side of Pie Island, bearing 34° (NNE. $\frac{1}{4}$ E.), steering thus for $6\frac{1}{2}$ miles, until Pie Island Light comes abreast, when haul up 4° (N. $\frac{1}{4}$ E.) for 10 miles to give Welcome Islands a berth of 880 yards. As soon as the north end of the latter islands comes abreast, a vessel may haul over for Fort William or keep on for Port Arthur. At night those locally acquainted pass between Mink Point and Mink Island, giving the latter a berth of 200 yards, and haul up for Pie Island Light, bearing 45° (NE. $\frac{1}{4}$ N.) until Deadman Island comes abreast, when they haul up for the Welcomes.

In leaving Port Arthur and Fort William, when clear of the entrance, head for the south end of the Welcomes until about 880 yards from them. Then steer to pass the same distance off the west shore of Pie Island or heading for Deadman Island. When Pie Island Light comes abreast, haul up for the gap between the Sisters and Mink Island, giving the west end of West Sister a berth of 200 yards to avoid the rock awash between it and Mink Island. Now bring the west side of Pie Island in range with the west side of the Sisters, heading for the west end of Jarvis Island. As soon as the north side of Cloud Islands comes in line with Victoria Island Lighthouse 236° (SW. $\frac{1}{4}$ W.), keep it so, rounding the lighthouse point at a distance of 300 yards, taking care not to pass northwest of the line, north side of the Sisters in one with Caldwell Point, to avoid Iroquois Rock.

Masters of vessels leaving Port Arthur or Fort William for Whitefish Point will find a very good check for their course across the lake by noticing the magnetic bearing by their own compasses of the range: Thunder Cape Lighthouse in range with the north end of the Welcomes $116^{\circ} 10'$ (SE. by E. $\frac{1}{4}$ E.).

Fort William is on the west side of Thunder Bay and a short distance up the Kaministiquia River. Fort William and the neighboring city of Port Arthur are the great shipping ports of the Canadian northwest. Fort William has railway workshops, large coal docks and grain elevators, and electric railway and telephone connection with Port Arthur. It had a population of 20,854 (1916).

Shoals.—The shoals extending offshore between the main mouth and Mission River are sandy and have a very gentle slope, so that

sailboats may ground 880 yards out. From Mutton Island to the shore the water is so shoal that it is scarcely possible for even a row-boat to pass. A shoal with 11 feet depth, 1.4 miles 112° (ESE. $\frac{1}{4}$ E.) from Kaministikwia Light and 1.2 miles 22° (N. by E. $\frac{3}{4}$ E.) from the east end of Mutton Island, and Burke Shoal, on the south side of Mission River approach, constitute the easterly limits of the offshore foul area.

Buoys.—A red spar buoy marks the 11-foot shoal 1.4 miles 112° (ESE. $\frac{1}{4}$ E.) from Kaministikwia Light.

A red spar buoy marks Burke Shoal.

Harbor.—Kaministikwia River forms the harbor, rises in Dog Lake at an elevation of about 718 feet above Lake Superior, and flows southerly and then easterly to the lake, a distance of about 42 miles. Falls and rapids are found along its course down to a few miles above the lake. It bifurcates twice in the vicinity of Fort William, the two outlets above the main mouth being known as McKellar and Mission Rivers.

Entrance channels.—Extensive dredging operations have deepened and widened the two entrance channels over the bar and the three river channels and provided basins for the use of vessels. The improved river channels have an aggregate length of 13 miles, and the harbor frontage available for dockage amounts to $22\frac{1}{4}$ miles, about one-third of which is built up. For the purpose of extending the period of navigation, powerful tugs are employed in the fall of the year to prevent the formation of ice on the shoals at the mouth of the river, or to break it loose if formed, and thus keep the channel open for a longer time; also in the spring, to provide earlier communication with the open lake.

Mission River entrance is about $2\frac{1}{4}$ miles south of the main river mouth and affords direct access to the Canadian Government Railroad terminals. The dredged entrance in the bay is 22 feet deep or over for the northerly 450 feet of its 600 feet width, and in the south side, adjacent to the revetment wall, the depth varies from 14 to 22 feet. The inside channel, from the bay to the junction with Kaministikwia River, has a depth of 19 feet or more for a width of 300 to 425 feet. The turning basin on the south side of the channel immediately within the shore line and the three railroad slips at the west side of the basin are deepened to 20 feet or more.

Mission channel entrance light, flashing white, 26 feet above water, visible 10 miles, is shown from a white pole on the outer end of the end of the pier on the south side of the channel entrance.

Range lights—Front light.—A fixed red light 25 feet above water, visible 7 miles, is shown in conjunction with a triangular day mark from a mast on the south side of Mission Channel 704 yards west of the mouth of the channel.

Rear light.—A fixed red light, 38 feet above water, visible 7 miles is shown in conjunction with a triangular day mark from a mast 533 yards 290° (WNW. $\frac{3}{4}$ W.) from the front light.

These in range mark the axis of the channel.

Buoys.—The northern side of the entrance to Mission Channel is marked by red spar buoys.

McKellar River, from its junction with Kaministikwia River to its mouth at the shore line of Thunder Bay about $1\frac{1}{2}$ miles south of the main mouth, is deepened to 22 feet or more for a width of 350 feet, except that the width through the Canadian Pacific Railroad Bridge reduces to 70 feet. It has no direct entrance from the bay.

Kaministikwia River.—The channel across the bar at the mouth of Kaministikwia River is 23 feet deep and 600 feet wide, its north edge being in prolongation of the south face of the Empire Elevator Wharf. In Kaministikwia River, from the Empire Wharf to the Mission River junction the depth is 22 feet or more for a width of 300 to 475 feet, except that the width through the Canadian Pacific Railroad Bridge reduces to 120 feet. From Mission River junction up to the Westfort turning basin, the depth is 21 feet or more for a width of 250 to 400 feet, except that, at the waterworks crossing above elevator D, the width is 175 feet and there is a least depth of 19 feet; also, through the Canadian Government Railroad Bridge the width reduces to 100 feet. In the Westfort turning basin at the head of the improvement there is 20 feet depth or more.

Light buoys.—A red cylindrical buoy showing an occulting red light is moored on the north side of the dredged cut at the outer end.

Light and bell buoy.—A black cylindrical buoy showing an occulting white light is moored on the south side of the dredged cut at the outer end.

Fog signal.—The fog signal is made on a bell sounded by the action of the waves.

Light.—A fixed red light, 25 feet above water, visible 10 miles, is shown from a white mast on the Empire Elevator Wharf on the north side of the channel.

Buoys.—The south side of the channel is marked by black spar buoys.

Night signal on Government railroad bridge.—An electric switch, installed in the signal tower of the Canadian Government Railroad Drawbridge over Kaministikwia River at Fort William, is operated as follows: When a vessel whistles to have the bridge opened, the operator, if in position to open the draw, immediately flashes all lights in the tower off and on three distinct times.

Storm warnings are displayed from a signal mast at the upper end of Canadian Pacific Railroad freight shed No. 5, 125 feet from the river.

Port Arthur.—On the west side of Thunder Bay, adjoining Fort William on the north. It has extensive railroad terminals, grain elevators, and is an important shipping point of the Canadian northwest. The population (in 1916) was 12,500.

Breakwaters.—The main harbor is formed by breakwaters extending in front of the wharves on the water front of the city, from the Horne Elevator Wharf on the north to a point about 830 yards from the Kaministiquia River entrance channel on the south. The northerly breakwater is 1,217 yards long and extends from a point outside of the Horne Elevator Wharf at the north end of the harbor about south-southwest to the main entrance. The middle breakwater is about 1.1 miles long, running from the main entrance to the northerly side of the southerly entrance at the Thunder Bay and Dominion Government elevators. The southerly breakwater extends southeastward, with an entrance opening of 375 feet between the two breakwaters. The breakwaters have converted what was originally an exposed roadstead into a safe and commodious harbor.

Harbor and entrance channels.—The main entrance between the breakwaters is 122 yards wide, and the dredged channel leading in from deep water about 700 yards outside is 350 feet wide and 24.5 feet deep. The part of the main harbor basin between the breakwaters and the frontage of the Canadian Northern Railway docks is dredged to a depth of 19.5 feet or more. King's Channel, with the same depth and 500 feet or more wide, leads from the above deep area northerly through the shallow part of the basin to the Horne Elevator Wharf. The harbor basin south from the basin adjacent to the main entrance is from 583 to 700 yards wide and 24.5 feet deep, extending to the south entrance and the Dominion Government elevator; the easterly edge of deep water is 150 feet from the inner face of the breakwater and is not marked. The south entrance channel from the lake to this basin is 500 feet wide and 24.5 feet deep.

A depth of 20 feet or more is maintained in the various railway and elevator slips.

Buoys.—The channels are marked by spar buoys and are lighted as described below.

Lights.—A flashing white light, 43 feet above water, visible 12 miles, is shown from a mast on the north side of the south entrance to Port Arthur Harbor.

A fixed red light, 38 feet above water, is shown from the power house on the Thunder Bay Elevator Wharf.

An occulting white light, 43 feet above water, visible 12 miles, is shown from a white square structure on the north breakwater 10 yards from the south end.

Fog signal.—The fog signal is made on a bell.

Light and bell buoy.—A red cylindrical buoy showing an occulting red light is moored in 30 feet on the northeast edge of the dredged channel.

Fog signal.—The fog signal is made on a bell sounded by the action of the waves.

Trade.—During the year of 1915-16, 335,000,000 bushels of grain was handled at Fort William and Port Arthur.

Storm warnings.—Day and night signals are displayed from a steel tower on the roof of the customhouse, at an elevation of 127 feet above lake level. Forecasts are broadcasted by radio station at 11.30 p. m.

A radio station is operated by the Canadian Government all the year; after close of navigation station is not open between 8 p. m. and 8 a. m.; call letters VBA; working distance 350 miles.

Bare Point Breakwater.—At Bare Point, about 2 miles to north-eastward of the Port Arthur Breakwater Harbor, there is a rubble-mound breakwater, extending from the end of the point.

In the approach to the United Grain Growers', Saskatchewan Co-operative, and Richardson elevators, on the bay front about 1 mile southwest of Bare Point, a basin has been dredged to a depth of 24.5 feet, extending from deep water in to within 200 feet from the lake face of the wharves; also, slips have been dredged from the basin to and alongside the elevator wharves; with depths of 21 feet or more. The limits of the basin and slips are indicated by spar buoys. To afford protection to these elevator docks, pending extension of the permanent breakwater from Bare Point, two temporary pile breakwaters have been built, each about 251 yards long; one running in a north and south direction on the northeast and the other in an east and west direction on the southwest of the two dredged channels.

Dry docks.—The dock of the Port Arthur Shipbuilding Co. at Bare Point, to the northeast of the elevators above mentioned, has the following dimensions: Length over all, 736 feet; length on keel blocks, 679 feet; width at top, 98 feet; top width at entrance, 77 feet; bottom width at entrance, 72 feet; depth on sill (low-water datum), 16 feet. The dredged channel leading northerly from the Saskatchewan elevator channel to the dry dock, is 200 feet wide and 16.5 feet deep, its entrance being indicated by spar buoys.

The Canadian Towing & Wrecking Co. has a floating dock 100 feet long, with clear inside width of 58 feet, admitting vessels of 15-foot draft.

Intake pipes near Bare Point.—Two waterworks intake pipes, laid by the city of Port Arthur, extend from a point on the shore 1.49 miles 25° (NNE. $\frac{1}{4}$ E.) from Bare Point at the waterworks pump house into the lake 783 yards $127^{\circ} 33'$ (SE. $\frac{1}{4}$ E.).

Mariners are warned not to anchor their vessels in the vicinity of these pipes.

Coast.—From Thunder Cape Light, 10 miles easterly to Black Bay entrance strangers should keep outside the group islands of which Trowbridge Island is the most southerly and westerly and Shangoia Island the largest. Silver Islet (marked by buildings), northeast of Shangoia Island, has rocky spits extending north and northeast by north from it. One thousand five hundred and forty yards 81° (E. $\frac{1}{4}$ N.) from Silver Islet is Maloney Shoal, a detached 12-foot spot, and 880 yards northeast of this spot a very shallow shoal continued northeast over 1 mile, to abreast of Middlebrun Bay; Sandy Island is on this shoal.

Silver Islet Harbor, Ont.—There is a depth of 15 feet at the wharf and good shelter from all winds. Vessels may also approach the wharf from the eastward by keeping Silver Islet Rock close aboard and leaving the small rocks about 880 yards northeast of the wharf on the port hand distant 200 yards, and then steering for the wharf.

Range lights—Front light.—A fixed white light, 10 feet above water, visible 2 miles, is shown from a mast on the wharf on the mainland inside of Burnt Island.

Rear light.—A fixed white light, 16 feet above water, visible 2 miles, is shown from a mast 39 yards 53° (NE. $\frac{1}{4}$ E.) from the front light.

This range leads to the wharf from southwestward between the shoals off Burnt Island and the Roman Catholic Church.

Black Bay and entrances.—A group consisting of Clark, Gravel, and Cranberry Islands, nearly connected by reefs and isolated rocks, forms the line of demarcation between the Middlebrun Channel and Montreal Channels constituting the main entrance into Black Bay. Middlebrun Channel leads between Sand and Clark Islands. Montreal Channel, between Clark and Porphyry Islands, is wider, more direct, and deeper, with Porphyry Point Light as a guide, and is to be preferred. To the northeast entrance into Black Bay may also be had by the Magnet Channel between Magnet and Edward Islands, but this channel should not be attempted by strangers.

Porphyry Point Light, fixed white, 56 feet above water, visible 13 miles, is shown from a white square tower on the extreme southwest end of Porphyry Island.

Fog signal.—The fog signal is made on a diaphone.

Vessels coming through Shaganash Channel may change course off Tunnel Island as soon as the light is seen.

Black Bay extends 38 miles in a northeasterly direction, being only $2\frac{1}{2}$ miles across at Edward Island, but widening to 10 miles near its head. This bay, as well as others along the northern coast, being in-

completely surveyed, should be navigated with great care; for safety, it is recommended not to venture too close to shore, but to keep only mid-channel courses.

Coast from Porphyry Point Light to Lamb Island Light.—

This stretch of coast $29\frac{1}{2}$ miles to the northeast is fronted by a continuous chain of islands and rocky shoals which renders inshore navigation dangerous. Attention is also called to the extraordinary local disturbances of the compass needle in this vicinity.

Shaganash Light, fixed white, 36 feet above water, visible 13 miles, is on the western end of Island No. 10, a small island lying to the westward of the northerly end of Shaganash Island, about 10 miles northeast of Porphyry Island.

Fog signal.—The fog signal is made on a hand horn.

Shesheeb Bay and Otter Cove, fine land locked harbors opening about $6\frac{1}{2}$ miles southwesterly from Lamb Island Light, afford good anchorage and protection from all winds. The approach to these harbors is free from dangers, except Manuel Rock, with 9 feet of water over it, lying about 660 yards west of the south end of Otter Island, and a $10\frac{1}{2}$ -foot spot about 440 yards off the westerly shore entering Shesheeb Bay. Otter Cove may be entered from either side of Otter Island.

Lamb Island, is on the west side of the entrance to Nipigon Strait.

Lamb Island Light.—A fixed white light 90 feet above water, visible 15 miles, is shown from a white square tower on the south-east side of the island.

Fog signal.—The fog signal is made on a hand horn.

Vessels from the southwestward should keep 1 mile to southward of Lamb Island Light and round into Nipigon Strait on a northerly course, passing about 880 yards to eastward of the light.

New Combe Rock, with about 4 feet least depth, is about 730 yards north of the light. Two spots, with 15 feet and 6 feet depths, form detached obstructions in the passage between Lamb and Spar Islands.

Sovereign Rock, with 12 feet of water, lies about 1,320 yards 202° (SSW.) of the light with a $7\frac{1}{2}$ -foot patch inside of it.

Nipigon Bay and Channels.—The greatest length of this bay from Wilson Island to the mouth of Nipigon River is about 40 miles, and it is about 15 miles in maximum width from the head of Nipigon Strait to Kama Bay. On the south the bay is inclosed from Lake Superior by St. Ignace, Simpson, Salter, and Wilson Islands. There are five ship channels leading into this bay, named from west to east as follows: Nipigon Strait, Moffat Strait, Simpson Channel, Salter Channel, and Schreiber or North Channel. The so-called Blind

Channel between Fluor Island and St. Ignace Island is closed by a bar with only 4 or 5 feet available depth over it.

Nipigon Strait.—The entrance into Nipigon Strait is between Lamb and Fluor Islands. By keeping in the middle between Fluor and Moss Islands and continuing the course in mid-channel between a group of small islands lying 1 mile beyond Moss Island, all dangers are avoided. After passing Fluor Island, favor the west shore of Nipigon Strait for a distance of 2 miles, whence a mid-channel course will lead safely into Nipigon Bay. Good anchorage in 6 fathoms and upward with mud bottom is found all through this strait.

Moffat Strait, having its lake entrance about 20 miles northeast of Lamb Island Light, passes between St. Ignace and Simpson Islands. This channel can only be used for vessels drawing less than 15 feet, being very shallow and narrow at its northerly inlet into Nipigon Bay. The southerly entrance is made by giving Grotto Point a wide berth and keeping Bead Island close aboard. After passing Bead Island, excellent holding ground in 6 to 16 fathoms, sand and mud bottom, with protection from all winds, is found anywhere in this landlocked strait.

Simpson Channel, 8 miles to the eastward of Moffat Strait and between Simpson and Salter Islands, is the safest and most used channel for vessels entering Nipigon Bay from the south or southeast. Keeping a mid-channel course, vessels can enter the bay without encountering any dangers.

Battle Island is located on the east side of the entrance, 28½ miles east-northeastward from Lamb Island Light.

Battle Island Light, fixed and group flashing white, 118 feet above water, visible 16 miles, is shown from a white octagonal tower on the southwest point of the island.

Fog signal.—The fog signal is made on a diaphone.

Salter Channel leads into Nipigon Bay between Salter and Wilson Islands. An unobstructed mid-channel passage leads safely into the bay, but, owing to its proximity to Simpson Channel, is rarely used.

Schreiber (North) Channel, about 11 miles east of Simpson Channel, is formed by Copper and Wilson Islands on one side and the main shore on the other. Being difficult of access, it is not recommended.

Dangers.—A dangerous reef, nearly awash, called Bread Rock, lies in the middle of the entrance from the lake, 1½ miles 127° (SE. ½ E.) from the east extremity of Copper Island.

A rock nearly awash lies about 1,540 yards 33° (NE. by N.) of the northwest point of Copper Island. North of Wilson Island,

Channel, Healey, and Quarry Islands divide the channel into crooked and intricate passages.

Nipigon Bay Islands and Shoals.—There are a number of detached rocky spots in Nipigon Bay, the most dangerous one, rising from deep water to within a few feet of the surface, lying $2\frac{3}{8}$ miles 337° (NW. by W. $\frac{1}{8}$ W.) from the northwesterly point of Salter Island. A small detached rocky spot lies about 880 yards 326° (NNW. $\frac{1}{8}$ W.) off the same point. In the westerly part of the bay, opposite Nipigon Strait, a group comprising Vert, La Grange, Burnt, Frog, and Outan Islands are connected with the shore of St. Ignace Island to the south by a shallow area with depths ranging from 12 to 22 feet. A rocky shoal with scant water lies about $1\frac{1}{2}$ miles in a 78° (E. $\frac{1}{8}$ N.) direction off the southern extremity of Vert Island. La Grange and the Outan Islands are connected with each other by very shoal water. Frog Island, lying 2 miles 247° (WSW. $\frac{1}{8}$ W.) off the south point of Outan Island, is surrounded with rocks and boulders, and there is only from 10 to 16 feet of water for $1\frac{1}{2}$ miles to the west of it and in the area between it and Outan, La Grange, and Burnt Islands.

The north coast of Simpson Island and that of St. Ignace Island, except adjacent to the above islands, have steep sandstone cliffs rising from shore with no off-lying obstructions. The north sides of Vert and La Grange Islands are also deep-to, but a 14-foot shoal exists about 1 mile west of La Grange Island and $1\frac{1}{4}$ miles 11° (N. by E.) of Burnt Island. The west shore of Nipigon Bay opposite Frog and Burnt Islands and the north shore opposite La Grange and Vert Islands are shallow and should be given a berth of $1\frac{1}{2}$ miles.

The north or mainland coast of Nipigon Bay has a number of indentations, including Kama, Mountain, Gravel, and Pays Plat Bays. From the sharp point of land south of the mouth of Jackfish River rocks and boulders extend 880 yards to the south and east, and care should be taken in entering Kama Bay, which has good water inside, to clear these obstructions. Shoal water with boulders and rocks extends 1,320 yards off the westerly point of Mountain Bay and continues along the shore to the mouth of Gravel River. The coast eastward in and beyond Gravel Bay may be approached within 590 yards, except for a 19-foot shoal 1,100 yards offshore on the east of Gravel Bay. The two islands in Pays Plat Bay should be approached with caution. To make Rossport on the main shore in Nipigon Bay, a mid-channel course 340° (N. by W. $\frac{1}{8}$ W.) through Salter Channel will lead into the immediate vicinity of this harbor. Rossport is a small fishing village with a good, natural harbor; there is a Government wharf.

Lamb Island to Copper Island.—Along the lake coast on the south side of the islands inclosing Nipigon Bay, from Lamb Island

Light to Battle Island Light, caution should be exercised in approaching the outlying group of islands and shoals extending from Fluor Island on a line toward the southeast end of St. Ignace Island, although a fairly straight, sheltered passage of good depth and width is available through this group to those locally acquainted. Duncan Cove, in the south shore of St. Ignace Island, affords good anchorage in 5 to 6 fathoms of water and protection from all but southeasterly winds. The approach from the lake is through unobstructed deep water on a course passing between 880 yards and $1\frac{1}{2}$ miles to eastward of the outlying islands. The south coast of St. Ignace Island, thence eastward, is more or less obstructed for 2 miles off by islands and shoals. In this stretch Armour Harbor, inclosed by Armour Island, affords good anchorage in 5 fathoms, mud bottom, and almost complete protection.

The south shore of Simpson Island should not generally be approached within 1 mile, and in making Woodbine and Morn Harbors exercise great caution in entering. From Battle Island Light eastward the same rocky character continues along the shores of Wilson and Copper Islands. Avoid Bread Rock, located nearly in mid entrance of Schreiber Channel into Nipigon Bay.

Coast.—From Nipigon Bay the coast trends eastward 42 miles to Peninsula Harbor. It has many indentations, and the shores are rocky, with many outlying rocks and reefs. Les Petits Écrits are a group of small rocky islands and reefs lying 2 miles southwest of the entrance to Terrace Bay, which opens about 6 miles east of Schreiber Channel. This bay has good water inside, but along the east shore near the middle and also off the entrance points are found a number of small rocky islets, which should be avoided.

Jackfish Bay, 9 miles east of Terrace Bay, forms a good harbor of refuge, with good anchorage in 6 to 8 fathoms in the northeast arm.

Light.—A fixed white light, 39 feet above water, visible 11 miles, is shown from a red square tower on the southwestern end of St. Patrick Bay.

Directions.—Entering Jackfish Bay, keep in the center between St. Patrick Island on the east side (upon which is a light) and Victoria Cape, both of which are prominent and easily distinguished at a distance of 3 miles.

A detached islet with surrounding rocks and reefs lies 1 mile offshore and 4 miles southeast of Jackfish Bay Light.

If bound to the Canadian Pacific coal dock, which is situated immediately north of the island and runs in an east and west direction, direct the course to starboard as soon as well past the island, when the dock will be clearly seen, the machinery for unloading being on

the south side of the dock, where 18 feet of water is found. The dock is 400 feet long; it is exposed to winds from a southerly direction, and sometimes vessels are forced to leave it and seek shelter at the anchorage. There is not sufficient water on the north side of the dock for a loaded boat to moor, if it is necessary when getting under way to break around the end of the dock. Care must be taken not to proceed too far in on the north side, there being but 15 feet of water for a short distance from the end.

Moberly Bay.—Northwestward from the coal dock is Moberly Bay, dangerous to enter unless locally acquainted. The anchorage is found by rounding the next point northward of the island at the entrance and steering about northeast until Moberly Bay closes, when come to in 6 to 8 fathoms of water in a landlocked harbor.

Slate Islands, a group of eight, the southerly and largest being 4 miles wide north and south and 5 miles long east and west, lie $5\frac{1}{2}$ miles south of Victoria Cape. There are many outlying rocks surrounding the northerly islands of the group, which should be carefully approached.

Light.—A fixed and group flashing white light, 224 feet above water, visible 20 miles, is shown from a white octagonal tower on the south end of South Slate Island, the summit of a hill forming the south side of Sunday Harbor, at the southern extremity of the island group.

Fog signal.—The fog signal is made on a diaphone.

Sunday Harbor.—The harbor is sufficiently large to admit any steamer and appears to be clear of dangers. Strangers can enter by keeping the coast of the island close aboard from a point about a mile west of the lighthouse. It is well sheltered from all except possibly southwesterly winds.

Bottle Point.—About $1\frac{1}{2}$ miles east of Jackfish Bay is Bottle Point, which forms the southeast side of L'Anse a la Bouteille, with islets and reefs in its entrance. From the point about $5\frac{1}{2}$ miles northeast of Bottle Point and to the east of the mouth of Prairie River rocks and reefs extend 1 mile offshore, and the shore continues broken northeasterly 3 miles to McKellar Harbor.

McKellar Harbor.—The latter affords anchorage in 9 fathoms behind the islands in its mouth, but the entrances are narrow and fringed with reefs.

Barclay Islands lie in deep water $1\frac{1}{2}$ miles south of McKellar Harbor.

Pic Island lies about a mile southerly from the bold headland $10\frac{1}{2}$ miles east of Bottle Point. The island is very prominent, about 3 miles long east and west by 2 miles in width, and has quite an irregular shore line. The channel immediately between the island and the mainland is generally deep. There are numerous detached

rocky reefs from $1\frac{1}{2}$ to $3\frac{1}{2}$ miles to the eastward of the island and reaching 3 miles southerly from the adjacent mainland.

Nicoll Shoal, with 12 feet depth, lies about in the middle of the west entrance, 660 yards 337° (N. by W. $\frac{7}{8}$ W.) from the north point of Pic Island.

Peninsula Harbor is at the east end of the extreme northerly shore of Lake Superior. **Manitoba Shoal**, with depth of less than 6 feet, lies in the north entrance to Peninsula Harbor, midway between the main shore and Hawkins Island at the entrance. To avoid all danger from this shoal the southeast entrance to the harbor should be taken.

Peninsula Harbor Light, fixed and group flashing white, 105 feet above water, visible 16 miles, is shown from a white, square tower on the south end of Hawkins Island.

Fog signal.—The fog signal is made on a hand horn.

Coast.—From Peninsula Harbor the coast trends about 44 miles south-southeast to Otter Island, thence southeasterly about 19 miles and easterly about 39 miles to Michipicoten Harbor. All this shore is bold and rocky and indented with numerous coves and harbors affording shelter for small craft in northerly and easterly gales. There are many outlying rocks and reefs extending from 440 yards to $1\frac{1}{2}$ miles offshore, and the coast should be approached with extreme caution.

Otter Island.—There is good shelter behind Otter Island, and also in Otter Cove behind Otter Head. The entrances to Big Daves Harbor are not deep enough for large steamers. A group of rocky islets with outlying reefs and bowlders, extending 1,320 yards in a northwesterly direction from the lighthouse located on the northwesterly end of Otter Island, should be given a wide berth in making Big Daves Harbor from the southward and westward. Shoal water extending 880 to 1,320 yards off around Otter Head should be avoided in making the entrance to Otter Cove. The coast from Otter Head to Michipicoten Harbor should not be approached nearer than 1,320 yards.

Otter Island Light, flashing white, 97 feet above water, is shown from a white octagonal tower on the northwesterly end of the island.

Fog signal.—The fog signal is made on a diaphone.

Michipicoten Island is located about $9\frac{1}{2}$ miles southerly from the shore near the bend southeasterly from Otter Island. It is about $17\frac{1}{2}$ miles long east and west and nearly 7 miles wide north and south. The south shore should be approached with caution, as there are many detached reefs and islets, extending, in the vicinity of Quebec Harbor, more than 2 miles offshore. Off the westerly side there are many islets and reefs extending 1 mile from shore.

Michipicoten Island East End Light, group flashing white, 84 feet above water, visible 15 miles, is shown from a hexagonal, pyramidal tower on the northeast end of the island.

Fog signal.—The fog signal is made on a hand horn.

Quebec Harbor is situated near the middle of the south coast of the island. Protection from all winds and good anchorage in 5 to 8 fathoms will be found in this snug harbor. A dredged cut with least width of 200 feet and least depth of 20 feet, extends through the entrance and into the deep water of the harbor.

Davieaux Island Light, fixed and group flashing white, 129 feet above water, visible 17 miles, is shown from a white octagonal pyramidal tower on the summit of the island near the northeastern end.

Range lights—Front light.—A fixed white light, 23 feet above water, visible 9 miles, is shown from a white, square, pyramidal tower on the north shore of Quebec Harbor.

Rear light.—A fixed white light, 67 feet above water, visible 13 miles, is shown from a white, square, pyramidal tower 200 yards 1° (N. $\frac{1}{4}$ E.) from the front light.

These in range lead through deep water between Hope and Davieaux Islands and also mark the axis of the dredged channel.

Buoys.—The entrance is marked by 3 red and 3 black spar buoys.

Cozens Harbor, near the southeasterly end of the island, is a fine harbor for small craft, affording good anchorage and protection from all but southerly winds.

Caribou Island, situated 22 miles south of Michipicoten Island, is about 4 miles long north and south, with maximum width of $1\frac{1}{2}$ miles, narrowing to a point at either extremity. The east shore should not be approached nearer than 880 yards. Dangerous reefs extend 1 mile northerly and westerly from the north and west shores, respectively, and shoal water with depth of 11 feet is found $2\frac{1}{2}$ miles in a southwesterly direction from the southern end of the island.

Light.—A group flashing white light, 99 feet above water, visible 15 miles, is shown from a white, hexagonal tower on a small island southwest of Caribou Island.

Fog signal.—The fog signal is made on a diaphone.

Michipicoten Harbor.—This harbor is formed by the northerly cove of Michipicoten Bay and is a lake terminal of the Algoma Central Railroad. It has a post office and telegraph station and is an important ore-shipping and coal-receiving port.

Michipicoten Harbor Light, fixed white, 70 feet above water, visible 14 miles, is shown from a white, square, wooden building on the southeast end of Little Gros Cap.

Fog signal.—The fog signal is made on a hand horn.

Lights.—A private light is shown from the northwesterly one of the three islands in the easterly part of the harbor.

A private range of red lights is located on the commercial pier.

Harbor.—The ore wharf and commercial pier are situated in the northernmost part of the harbor, and alongside them the water has been dredged to about 20 feet. In approaching bring the commercial pier on end (or the two red lights upon it in line, if lighted) until the east face of the ore wharf opens, when a vessel may haul over for the latter. The basin between the wharves, from 58 to 100 yards wide, has all been deepened to about 20 feet, but the slip off the east side of the commercial pier is only 50 yards wide. In the cove between the pier and the lighthouse a shallow-draft vessel will find good shelter and holding ground.

Michipicoten River, entering the east side of the bay, has a small Government wharf and warehouse at its mouth, for the accommodation of local residents.

Rock.—An uncharted rock with a depth of 18 feet over it, lies about midway between commercial pier and the ore dock $213^{\circ} 30'$ (SW. $\frac{1}{4}$ S.) from the southwest corner of commercial pier.

Brule Harbor.—The shore from Michipicoten Harbor southerly to Brule Point, a length of 12 miles, is steep-to. Brule Harbor is situated about 1 mile south of the point and affords excellent shelter with rather deep water. The southeast arm, about 11 fathoms deep, is nearly circular and has a very narrow entrance. The northern arm is larger and quite as deep.

Cape Gargantua is about 15 miles southerly from Brule Point, the intervening shore being generally bold. A shoal with 7 feet least water over it lies 880 yards north of Cape Gargantua.

Indian Harbor is small and lies in the southeast corner of the bay on the northerly side and $1\frac{1}{4}$ miles east of the extremity of the cape; it contains excellent anchorage and shelter. In entering, keep the south and west shores best aboard, to avoid some shoals in the entrance, and anchor off the old fishing shanties in the southwest corner of the harbor.

Islands and shoals.—Commencing at Cape Gargantua and extending about 3 miles southeast is a string of small islands and rocks, the largest and highest of which is called Devils Warehouse Island. Pannikin Shoal, a small rock with only 14 feet of water over it, lies 1,400 yards 168° (S. $\frac{1}{4}$ E.) from Hursley Island, the westernmost island off Cape Gargantua. With this exception there are no shoals outside the line of the islands and rocks. For those locally acquainted there are good passages through the islands.

There is good anchorage and shelter in Warp Bay, about 1 mile north of Devils Warehouse Island.

Gargantua Harbor, a small harbor of refuge, is about 4 miles southeast of the cape with a small island in the entrance.

It is in the northwest corner of the bay and is barely wide enough for fair-sized vessels to ride at anchor. The harbor may be entered by the passage either north or south of the island; the south entrance is wholly free from danger and is recommended.

There is a wharf in front of the light keeper's dwelling on the southwest side of the harbor, about 440 yards inside the extremity of the point. The depth at the face of the wharf is 16 feet; larger craft tie up to it.

Light.—A fixed white light, 85 feet above water, visible 15 miles, is shown from a white hexagonal tower on the summit of the small island at the entrance to Gargantua Harbor.

Fog signal.—The fog signal is made on a hand horn.

Rocks.—In the north entrance there are two rocks with 5 and 6 feet least water over them, one lying 200 yards northwest from the light and about 175 feet from the west side of the island and the other 660 yards 303° (NW. $\frac{3}{4}$ W.) from the light and about 165 yards off the southwest side of the point forming the southwest side of the harbor.

A mid-channel course about 47° (NE. $\frac{1}{2}$ E.) through the north entrance clears both rocks.

Coast.—The whole shore from Gargantua Harbor to Coppermine Point, trending about 25 miles southeasterly and then about 23 miles to south-southwest, may be approached to 440 yards and often closer, but there are numerous outlying islands and shoals which must be avoided.

Ella Island.—Shoal water extends 1,000 yards north by east to a depth of 16 feet, 765 yards about west by north to a depth of 15 feet, 430 yards south-southeast to a depth of 5 feet, and 730 yards nearly east to a depth of 11 feet, from the island.

Deep water approaches close to the bank, which is very shallow inside the extremes above given. The passage between Ella Island and Leach Island Bank is 1,320 yards wide, with 12 fathoms or more depth in the middle.

Leach Island, lies $6\frac{1}{2}$ miles southerly from Gargantua Harbor and 3 miles offshore; its shores are good outside a distance of 330 yards, except at the south point, where a dangerous reef extends 765 yards southwestward to a spot where a depth of only 5 feet exists, and also 600 yards south by east to a depth of 3 feet. Both these spots are deep-to on their outer sides.

Clearing marks.—As long as Ella Island is in sight west of Leach Island bearing 22° (NNE. $\frac{1}{4}$ E.), a vessel will be west of the reef.

Sparrow Shoal, a small ridge of boulders, lies 1.6 miles west-northwest from the most westerly point of Leach Island. The eastern and shoalest spot has upon it only 12 feet of water, and from it the

ridge extends 200 yards 253° (WSW. $\frac{3}{4}$ W.) to a depth of 15 feet. A depth of 8 fathoms may easily be carried between this shoal and the shoal water off Leach Island.

Clearing marks.—The northeast point of Montreal Island, in range with the south point of Leach Island, bearing 126° (SE. $\frac{1}{2}$ E.), leads 350 yards southwest of the shoal, and Bald Head, the conspicuous white bluff on the main shore north of Lizard Island in range with the north point of Leach Island, bearing 81° (E. $\frac{1}{2}$ N.), leads 700 yards north of it.

Lizard Islands, seven in number, form a low group $2\frac{3}{4}$ miles long northeastward and southwestward by 1,320 yards wide, lying 5 miles east-southeast of Leach Island.

Shoal water surrounds the group on the west side for 1 mile, on the south for 880 yards, on the east for 200 yards, and on the north for 500 yards.

The passage between the group and the main shore is 1 mile wide and 20 fathoms deep.

Ganley Rock, with 18 feet least water over it, lies 3 miles east by south from the south point of the large island next to the south one of the Lizards and 2 miles offshore.

Shoal.—From the same point, a shoal with 21 feet least depth, lies $2\frac{3}{4}$ miles 105° (ESE. $\frac{3}{4}$ E.), being about 880 yards west-southwest from Ganley Rock.

Clearing marks.—To clear the very shallow reefs on the west side of the Lizards vessels should keep to the westward of a line bearing 22° (NNE. $\frac{1}{4}$ E.) on Bald Head, and to pass eastward of Ganley Rock and the northeast end of the Lizards should keep to eastward of a line bearing 326° (NNW. $\frac{3}{4}$ W.) on the same headland.

Griffon Reef lies north of the northwest corner of Montreal Island, its southerly edge, with 18 feet draft, being $1\frac{3}{4}$ miles distant, and the northerly end, with rocks awash, about 2 miles distant. Between the island and the shoals there is a channel over 1 mile in width having 15 fathoms or more depth.

Montreal Island is of square formation, about $1\frac{3}{4}$ miles each way, and is situated about $6\frac{1}{2}$ miles south-southeast from the Lizards. Shoal water of a uniform character surrounds it for a space of only 400 to 800 yards, the depth increasing rapidly beyond this limit.

Montreal Shoal is a dangerous detached obstruction, with 6 feet least depth near its northerly end, which is $3\frac{1}{4}$ miles 120° (SE. by E.), from the southwest corner of Montreal Island. The shoal extends south $1\frac{1}{4}$ miles, to a point $3\frac{1}{4}$ miles 340° (N. by W. $\frac{1}{2}$ W.), from the northwest corner of Theano Point. There is a least depth of 10 feet near the south end of the shoal. The shoal, with less than 20 feet depth, is about 1,100 yards wide.

Whitefish Point to Portage Entry.—From a point 2 miles 0° (N. $\frac{1}{4}$ E.) of the lighthouse steer a course 264° (W. $\frac{1}{2}$ S.) for 145 miles, which should bring Huron Island Lighthouse to bear 180° (S. $\frac{1}{4}$ E.), distant $2\frac{1}{2}$ miles, when change course to 266° (W. $\frac{1}{2}$ S.) for 20 miles to Portage Entry.

Whitefish Point to 5 miles 0° (north) of Manitou Island Light.—From a point 2 miles 0° (N. $\frac{1}{4}$ E.) of the lighthouse, steer a course 291° (WNW. $\frac{1}{8}$ W.) for 133 miles, which should bring the lighthouse on the eastern end of Manitou Island to bear 180° (south), distant 5 miles.

From this point courses may be laid as follows: For Ontonagon.—From the point 5 miles 0° (north) of Manitou Island Light steer 270° (W. $\frac{1}{8}$ S.) for $26\frac{3}{4}$ miles, which should bring Eagle Harbor Lighthouse to bear 180° (S. $\frac{1}{8}$ E.), distant about $2\frac{1}{4}$ miles, when change to 234° (SW. $\frac{5}{8}$ W.) for 7 miles, which should bring Fourteen Mile Point Lighthouse to bear 130° (SE. $\frac{5}{8}$ E.), distant about 3 miles, when change course to 222° (SW. $\frac{1}{2}$ S.) for $12\frac{1}{4}$ miles, which will lead to a point $1\frac{1}{2}$ miles 330° (NNW. $\frac{1}{8}$ W.) from Ontonagon Light, when follow directions for entering harbor.

For Chequamegon Bay.—From a point 5 miles 0° (north) of Manitou Island Light steer 270° (W. $\frac{1}{8}$ S.) for $26\frac{3}{4}$ miles, which should bring Eagle Harbor Lighthouse to bear 180° (S. $\frac{1}{8}$ E.), distant about $2\frac{1}{4}$ miles. From this point change course to 247° (SW. by W. $\frac{5}{8}$ W.) for 133 miles, which should lead to South Channel, when follow directions for Washburn and Ashland.

For Superior Entry.—From a point 5 miles 0° (north) of Manitou Island Light steer 270° (W. $\frac{1}{8}$ S.) for $26\frac{3}{4}$ miles, which should bring Eagle Harbor Lighthouse to bear 180° (S. $\frac{1}{8}$ E.), distant about $2\frac{1}{4}$ miles. From this point change course to 257° (WSW. $\frac{5}{8}$ W.) for $124\frac{1}{2}$ miles, which should bring Devils Island Lighthouse to bear 180° (S. $\frac{3}{8}$ E.), distant $1\frac{1}{2}$ miles. At this point change course to 246° (SW. by W. $\frac{1}{4}$ W.) for $66\frac{1}{2}$ miles, which leads to Superior Pierhead Lights.

For Duluth.—Follow directions as above to Devils Island Light, when change course to 251° (SW. by W. $\frac{5}{8}$ W.) for 68 miles, which leads to Duluth Canal Entrance.

For Two Harbors.—Follow directions as above to Devils Island Light, when change course to 262° (WSW. $\frac{3}{4}$ W.) for $44\frac{1}{2}$ miles, which leads to Agate Bay.

Whitefish Point to Fort William or Port Arthur.—From a point 2 miles 0° (N. $\frac{1}{4}$ E.) of Whitefish Point Lighthouse steer a course 302° (NW. by W. $\frac{1}{8}$ W.) for 186 miles, which should bring Passage Island Lighthouse to bear 0° (N. $\frac{1}{8}$ W.), distant about $1\frac{1}{2}$ miles, when change course to 278° (W. $\frac{5}{8}$ N.) for 27 miles, which should bring the lighthouse on Thunder Cape to bear 0° (N. $\frac{1}{4}$ W.),

distant 3 miles, when change course to 312° (NW. $\frac{1}{2}$ W.) for $14\frac{1}{2}$ miles, when follow directions for Fort William or Port Arthur.

Whitefish Point to Nipigon Bay, Battle Island Entrance.—From a point 2 miles 0° (N. $\frac{1}{2}$ E.) of Whitefish Point Lighthouse steer a course 318° (NW. $\frac{1}{2}$ N.) for $179\frac{1}{2}$ miles, which should bring Battle Island Lighthouse to bear 0° (north), when follow directions for the East Entrance.

Whitefish Point to Quebec Harbor, Michipicoten Island.—From a point 2 miles 0° (N. $\frac{1}{2}$ E.) of Whitefish Point Lighthouse steer a course 329° (NNW. $\frac{1}{2}$ W.) for 72 miles, which should lead to the entrance, when follow directions for Quebec Harbor.

Whitefish Point to Michipicoten Harbor.—From a point 2 miles 90° (E. $\frac{1}{2}$ S.) of Whitefish Point Lighthouse steer a course of 350° (N. $\frac{1}{2}$ W.) for 58 miles, which should bring Cape Gargantua to bear 90° (E. $\frac{1}{2}$ S.), distant 4 miles, when change course to 25° (NNE. $\frac{1}{2}$ E.) for $25\frac{1}{2}$ miles, which leads into Michipicoten Bay, when follow directions for entering the harbor.

In clear weather the inside passage may be taken from the Head of St. Marys River as follows:

Having the head of St. Marys Range astern, when the lighthouse on Point Iroquois bears 180° (S. $\frac{1}{2}$ W.), change course to 1° (N. $\frac{1}{2}$ W.) for 22 miles. This will bring the lighthouse on Corbeil Point dead ahead, distant about 2 miles, when change course to 315° (NW. $\frac{1}{2}$ N.) for $12\frac{1}{2}$ miles, which should bring the lighthouse on Coppermine Point to bear 90° (E. $\frac{1}{2}$ S.), when change course to 345° (N. by W. $\frac{1}{2}$ W.). This course passes to the westward of Mica Shoal, which is marked by a red and black spar buoy and leads close to Cape Gargantua. After running 38 miles on this course Gargantua Harbor may be made by changing course to 45° (NE. $\frac{1}{2}$ E.) for $4\frac{1}{2}$ miles, or continue on to Michipicoten Harbor as before.

Portage Lake Ship Canal to Duluth.—When well outside of the breakwaters shape a course 264° (W. $\frac{3}{4}$ S.) for $98\frac{1}{2}$ miles, so as to pass about $1\frac{1}{2}$ miles 0° (N. $\frac{3}{4}$ W.) of Devils Island Light. At this point change course to 251° (SW. by W. $\frac{1}{4}$ W.) for 68 miles, for Duluth Canal, or 246° (SW. by W. $\frac{3}{4}$ W.) for $66\frac{1}{2}$ miles, which leads to Superior Entry.

For the route in the opposite direction reverse the above courses.

Portage Lake Ship Canal to Agate Bay.—When well outside the breakwaters shape a course 264° (W. $\frac{3}{4}$ S.) for $98\frac{1}{2}$ miles, so as to pass about $1\frac{1}{2}$ miles 0° (N. $\frac{3}{4}$ W.) of Devils Island Lighthouse, when change course to 262° (WSW. $\frac{1}{4}$ W.) for $44\frac{1}{2}$ miles, which leads into Agate Bay (Two Harbors).

For the route in the opposite direction reverse the above courses.

Ontonagon to Duluth.—When well clear of the harbor steer a course 287° (WNW. $\frac{1}{4}$ W.) for $50\frac{1}{2}$ miles, when Outer Island Light-

house should bear 225° (SW. $\frac{3}{4}$ S.), distant about $2\frac{1}{2}$ miles, when change course to 270° (W. $\frac{1}{4}$ S.) for 17 miles, when Devils Island Light should bear 180° (S. $\frac{3}{4}$ E.), distant $1\frac{1}{2}$ miles, then change course to 251° (SW. by W. $\frac{1}{4}$ W.) for 68 miles to Duluth or to 246° (SW. by W. $\frac{3}{4}$ W.) for $66\frac{1}{2}$ miles for Superior Entry.

For the route between the same points in the opposite direction reverse the above courses.

Caution.—In making the run from Devils Island to Duluth in thick weather masters of vessels are cautioned about the magnetic disturbances near the north shore in this vicinity, and it might be well to shape the course about midway between the lights at Duluth and Superior Entry until the fog signals are heard, when the position of the vessel can be determined with sufficient accuracy to shape the correct course for either entrance. The depth in this vicinity is also a good indication of the distance from the shore, and the lead should be kept going.

Duluth to St. Marys River by Keweenaw Point.—When well clear of the harbor, steer a course 71° (NE. by E. $\frac{1}{4}$ E.) for 68 miles, which should bring the lighthouse on Devils Island to bear 180° (S. $\frac{3}{4}$ E.), distant $1\frac{1}{2}$ miles, when change course to 77° (ENE. $\frac{1}{4}$ E.) for $124\frac{1}{2}$ miles, which should bring Eagle Harbor Lighthouse to bear 180° (S. $\frac{1}{4}$ E.), distant 2 miles; then change course to 90° (E. $\frac{1}{4}$ N.) for $26\frac{1}{2}$ miles, which should bring Manitou Island Light to bear 180° (south), distant 5 miles; then change course to 111° (ESE. $\frac{1}{4}$ E.) for 133 miles, which should bring Whitefish Point to bear 180° (S. $\frac{1}{4}$ W.), distant 2 miles, when change course to 141° (SE. $\frac{1}{4}$ S.) for 25 miles, passing between Point Iroquois Light and Gros Cap Reef Light and Bell Buoy, when, picking up the head of St. Marys Range, follow the directions for St. Marys River.

Duluth to St. Marys River by Portage Lake Canal.—Steer the same course and distance as above to Devils Island Light, when change course to 84° (E. $\frac{1}{4}$ N.) for $98\frac{1}{2}$ miles to the breakwater at Portage Lake Ship Canal. Leaving the canal at Portage Entry steer 83° (E. $\frac{1}{4}$ N.) for $18\frac{1}{2}$ miles, when Huron Island Lighthouse should bear 180° (S. $\frac{1}{4}$ E.), distant $2\frac{1}{2}$ miles, when change course to 96° (E. $\frac{1}{4}$ S.) for $144\frac{1}{2}$ miles, which should bring Whitefish Point to bear 180° (S. $\frac{1}{4}$ W.), distant 2 miles, when steer the course above mentioned for the Head of St. Marys River Range.

Fort William or Port Arthur to St. Marys River.—When well outside the harbor steer 132° (SE. $\frac{1}{4}$ E.) for $14\frac{1}{2}$ miles, which should bring Thunder Cape Light to bear 0° (N. $\frac{1}{4}$ W.), distant 3 miles, when change course to 98° (E. $\frac{1}{4}$ S.) for $26\frac{1}{2}$ miles, which should pass about 1 mile south of Passage Island Lighthouse, when change course to 122° (SE. by E. $\frac{1}{4}$ E.) for 186 miles, which should

bring Whitefish Point to bear 180° (S. $\frac{1}{4}$ W.), distant 2 miles, when steer the course above mentioned for the Head of St. Marys River.

Duluth to Ontonagon, through Apostle Islands.—When well outside the harbor shape a course 73° (ENE.) for $59\frac{1}{2}$ miles, when, with Sand Island Light bearing 236° (SW. $\frac{1}{2}$ W.), distant about 3 miles, the passage between York and Raspberry Islands will open out, when change course to 143° (SE. $\frac{3}{4}$ S.) for $11\frac{1}{4}$ miles, keeping in mid-channel and passing Raspberry Island Light at a distance of about $\frac{1}{2}$ mile. When the southwest point of Oak Island bears 0° (N. $\frac{3}{4}$ W.), change course to the eastward, passing north of Hermit Island and midway between Stockton and Michigan Islands on the north and Madeline Island on the south. When Michigan Island Light bears 0° (N. $\frac{3}{4}$ W.), distant not less than $1\frac{1}{4}$ miles, change course to 87° (E. $\frac{1}{4}$ N.) for 54 miles, which should bring a vessel off Ontonagon.

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